GLOW PLUG SYSTEM, CHECKING

NOTE:

- **Verify that the glow plug (ceramic) - Part No. N 105 916 01 - was well packed and the glow plug is not broken or fractured.**
- **Handle the glow plugs with extreme care, do not bump or drop them.**
- **When installing, first tighten glow plugs by hand and then use the special tool to tighten to the appropriate torque.**
- **NEVER use a glow plug that has been dropped or hit, since it could be fractured and can damage the engine!**
- **Observe rules for cleanliness. See RULES FOR CLEANLINESS .**
- **Verify that glow plug is correct and not damaged BEFORE starting the engine whenever installing a glow plug, See GLOW PLUGS, CHECKING .**
- **If the glow plug is broken, remove it and remove the broken fragment(s) from the engine BEFORE starting the engine. Otherwise engine damage can occur!**

CAUTION: Part numbers are for reference only. Always check with your Parts Dept. for the latest information.

SPECIAL TOOLS AND EQUIPMENT

- V.A.G 1526 Manual multimeter

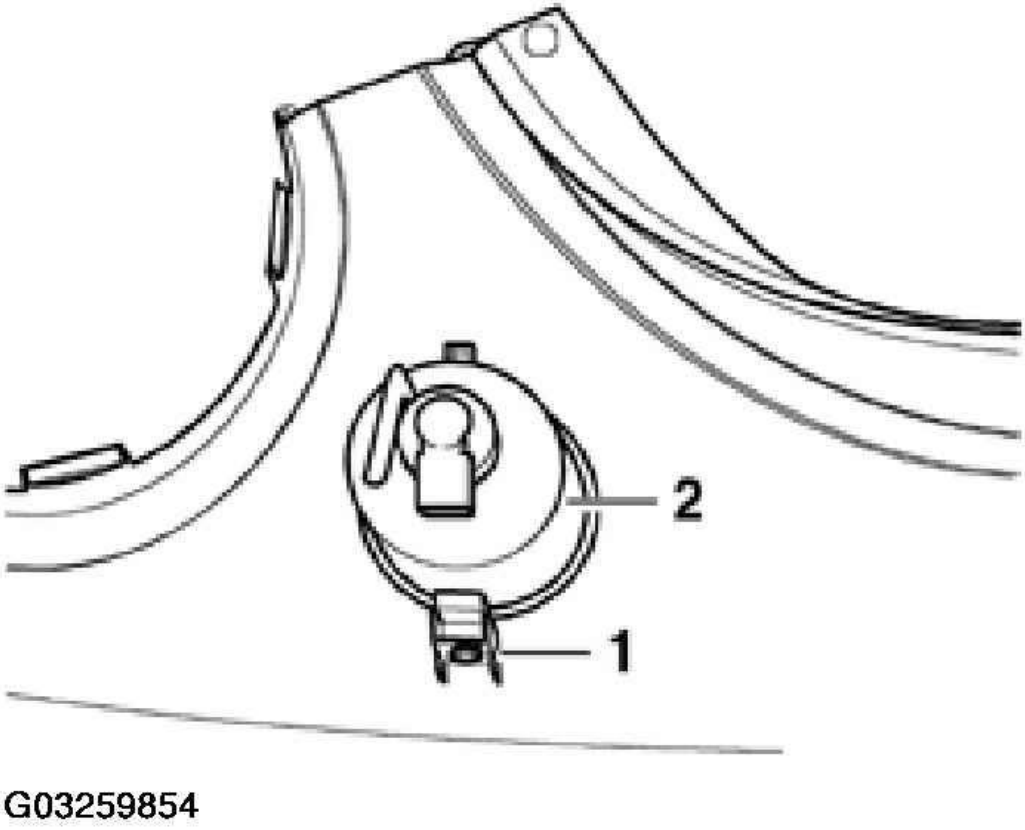


Fig. 1: Identifying V.A.G 1526 Manual Multimeter
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1594 A Adapter set

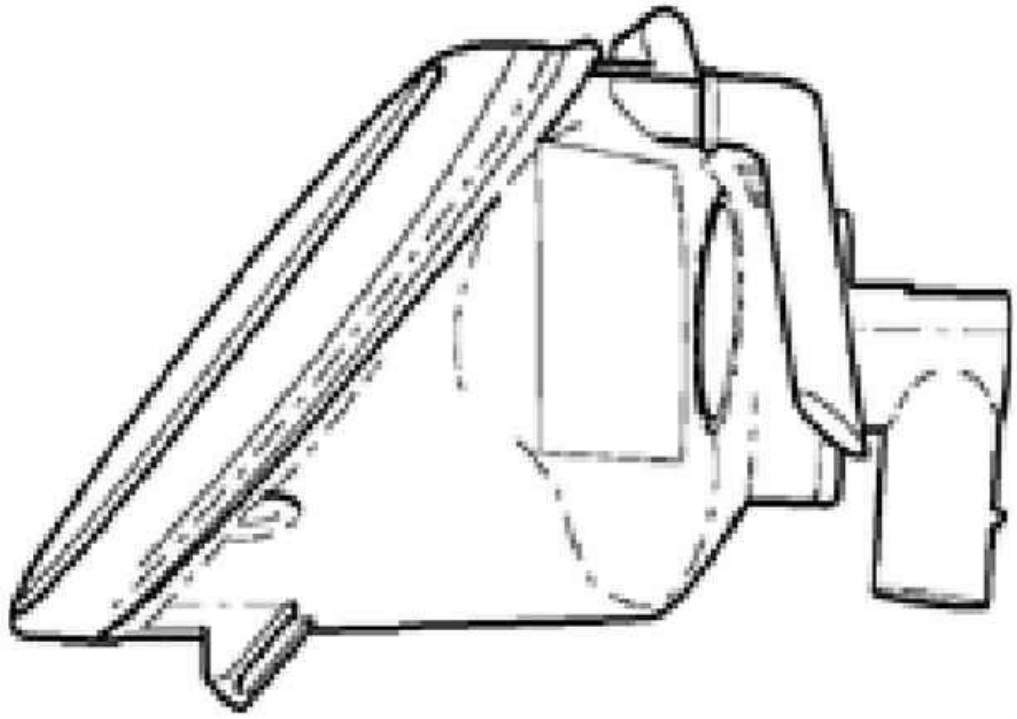


Fig. 2: Identifying V.A.G 1594 A Adapter Set
Courtesy of VOLKSWAGEN OF AMERICA, INC.

REQUIREMENTS

- Stripe fuse for glow plugs in fuse holder/battery OK
- Battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window defogger, must be switched off.
- Diesel Direct Fuel Injection (DFI) Engine Control Module (ECM) -J248- OK

WORK SEQUENCE

- Remove connector on coolant temperature sensor. See **DIESEL DIRECT INJECTION SYSTEM, COMPONENT LOCATION OVERVIEW** .

NOTE: By pulling off the connector, the engine condition "cold " is simulated and when the ignition is switched on the corresponding preheating process is

performed.

- Disconnect glow plug connectors from glow plugs.
- Connect multimeter to measure voltage between a glow plug connector and vehicle Ground (GND).
- Switch on ignition.

  For approx. 20 seconds, approx. battery voltage must appear.

- If no voltage is present:

  See Vehicle Diagnosis, Testing and Information System VAS 5051

  See appropriate System Wiring Diagram article

GLOW PLUGS, CHECKING

NOTE:

- **Verify that the glow plug (ceramic) - Part No. N 105 916 01 - was well packed and the glow plug is not broken or fractured.**
- **Handle the glow plugs with extreme care, do not bump or drop them.**
- **When installing, first tighten glow plugs by hand and then use the special tool to tighten to the appropriate torque.**
- **NEVER use a glow plug that has been dropped or hit, since it could be fractured and can damage the engine!**
- **Observe rules for cleanliness. See RULES FOR CLEANLINESS .**
- **Verify that glow plug is correct and not damaged BEFORE starting the engine whenever installing a glow plug, See GLOW PLUGS, CHECKING .**
- **If the glow plug is broken, remove it and remove the broken fragment(s) from the engine BEFORE starting the engine. Otherwise engine damage can occur!**

CAUTION: Part numbers are for reference only. Always check with your Parts Dept. for the latest information.

Special tools and equipment

- 3220 Jointed wrench

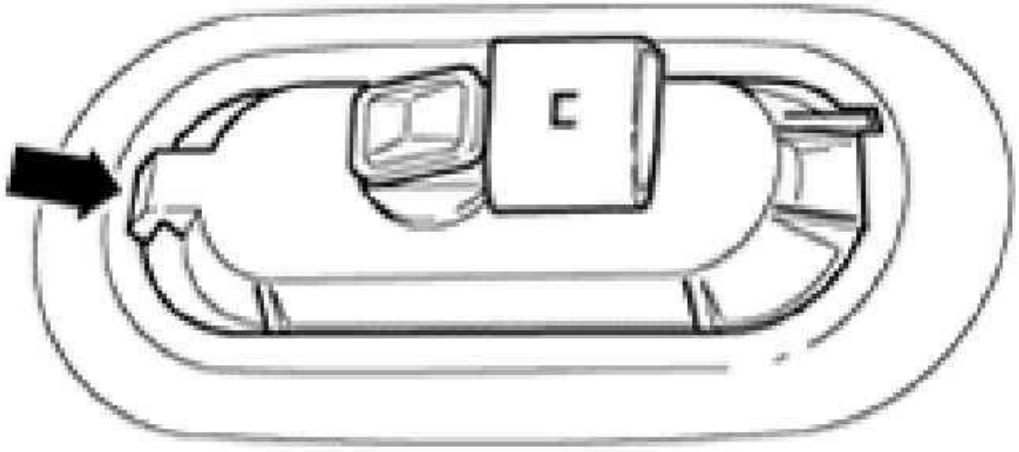


Fig. 3: Identifying 3220 Jointed Wrench
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- V.A.G 1594 A Adapter set
- V.A.G 1527 Diode test lamp

Requirements

- Stripe fuse for glow plugs in fuse holder/battery OK
- Battery voltage must be at least 11.5 V.
- All electrical consumers, e.g. lights and rear window defogger, must be switched off.

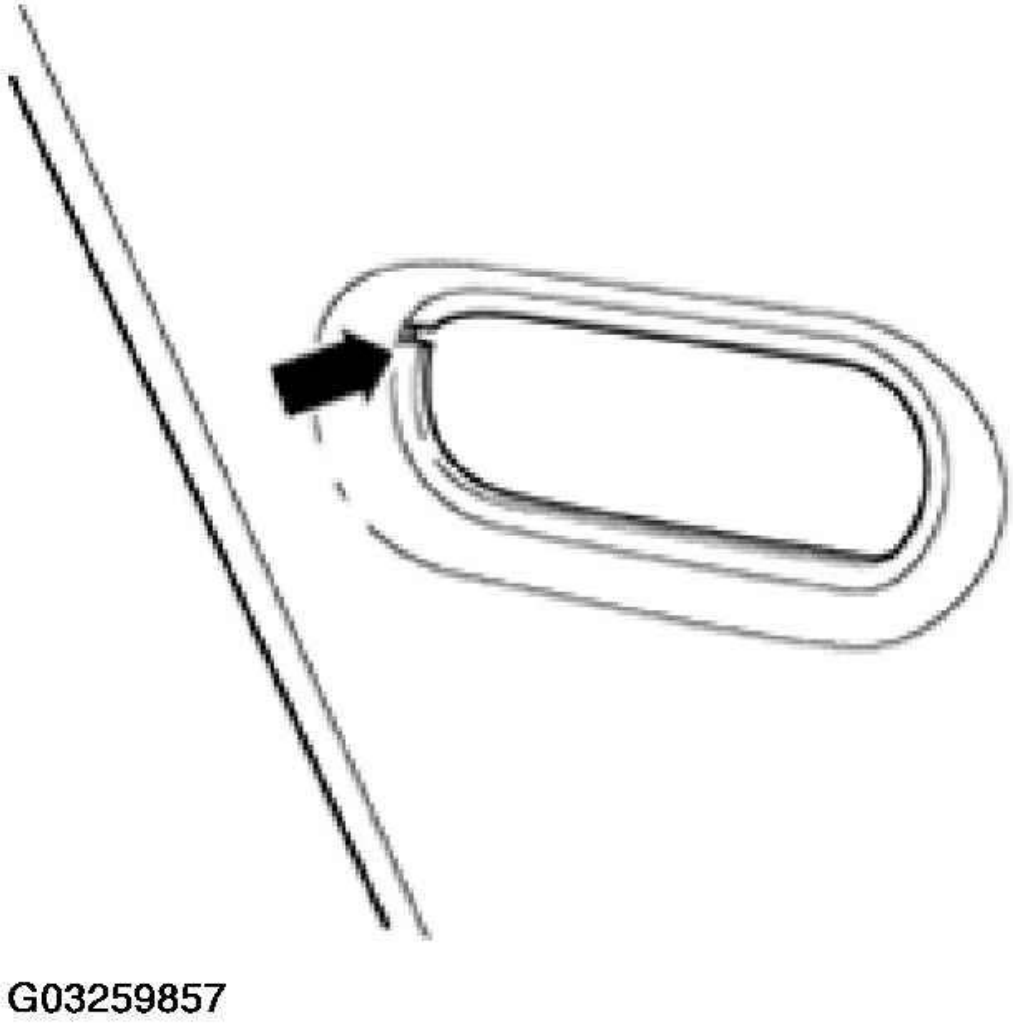


Fig. 4: Identifying V.A.G 1594 A Adapter Set
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Work sequence

- Disconnect glow plug connectors from glow plugs.
- Connect diode test lamp cable with clamps from adapter set to battery positive (+).

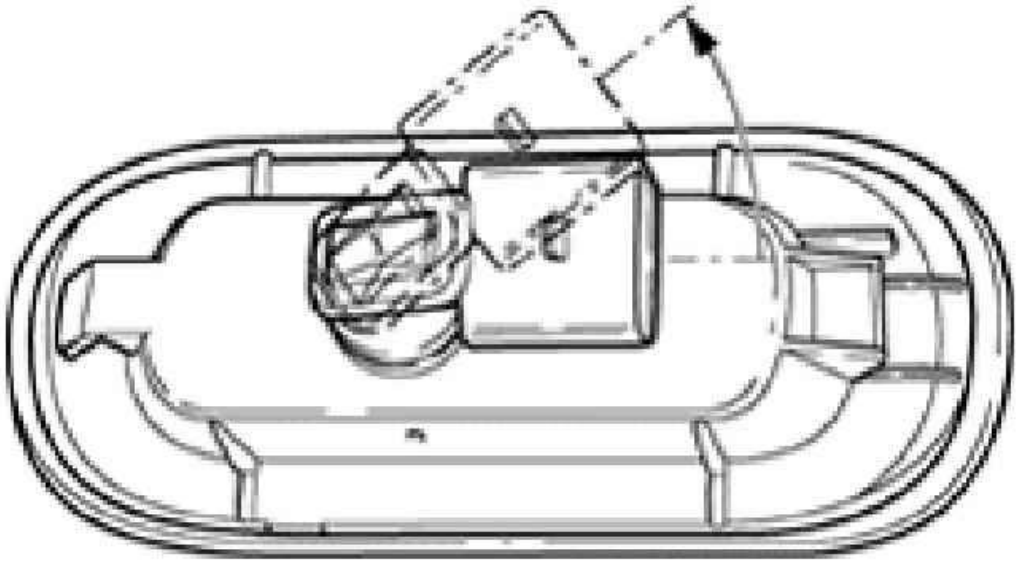


Fig. 5: Place Diode Test Lamp Test Pick On Every Glow Plug
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Place diode test lamp test pick on every glow plug one after another.

  Diode lights up: glow plug OK

  Diode does not light-up: replace glow plug.

- Install and remove glow plugs with jointed spanner 3220.

  Tightening torque: 15 N.m

Ignition Glow Plug System - New Beetle, 2.0L (AEG, AVH, AZG, BDC, BEV & BGD)

IGNITION SYSTEM, SERVICING

GENERAL NOTES ON IGNITION SYSTEM

- Only the components which specifically relate to the ignition system are covered here. For the other components of the injection and ignition system, see **MULTIPORT FUEL INJECTION (MFI) - 2.0L - AEG, AVH, AZG, BDC, BEV & BGD)** .
- For trouble-free operation of the electrical components, a voltage of at least 11.5 V is necessary.
- Disconnecting and connecting the battery must only be done with the ignition switched off, otherwise the engine control module could be damaged.
- During some checks it is possible that the control module will detect and store a fault. Therefore, after completing all checks and repairs the fault memory must be interrogated and, if necessary, erased. See **ENGINE CONTROL MODULE FAULT MEMORY, INTERROGATING AND ERASING** .
- If the engine starts, runs for a short period and then stops, after fault finding, repairs or component tests, then the fault may lie with the immobilizer which is blocking the engine control unit. In such cases the control unit must be adapted. See **COMPONENTS AND FUNCTIONS, ADAPTING** .

Safety precautions. See **SAFETY PRECAUTIONS** .

Test data, spark plugs. See **TEST DATA, SPARK PLUGS** .

IGNITION SYSTEM COMPONENTS, REMOVING AND INSTALLING

Engine code AEG

- Engine codes AVH, AZG, BDC, BEV, BGD. See **ENGINE CODES AVH, AZG, BDC, BEV, BGD** .

NOTE: The following list refers to items in Fig. 1 .

1. **10 N.m**
2. **Ignition wire**
   - With RF suppression type connector and spark plug connector
   - Pull spark plug connector off with T10112
   - Check for continuity
3. **Spark plug**
   - 30 N.m
   - Remove and install with 3122B
   - Type and electrode gap. See **TEST DATA, SPARK PLUGS**
4. **20 N.m**

- Tightening torque influences knock sensor function

5. **Knock Sensor (KS) 2 -G66-**
    - Sensor and connector terminals are gold-plated
6. **3-pin harness connector**
    - Terminals gold plated
    - Brown for KS 2 -G66-
7. **Knock Sensor (KS) 1 -G61-**
    - Sensor and connector terminals are gold-plated
8. **3-pin harness connector**
    - Terminals gold plated
    - Black for KS 1 -G61-
9. **Camshaft Position (CMP) sensor -G40-**
    - Location. See item - 17 - on **ENGINE CODE AEG**
10. **3-pin harness connector**
    - Black
    - For CMP sensor -G40-
11. **4-pin harness connector**
    - Black
12. **Ignition coils - N-, -N128-**
    - Marked for ignition cables: A = Cylinder 1, B = Cylinder 2, C = Cylinder 3 and D = Cylinder 4
    - With Power output stage -N122-
    - Location. See item - 12 - on **ENGINE CODE AEG** .

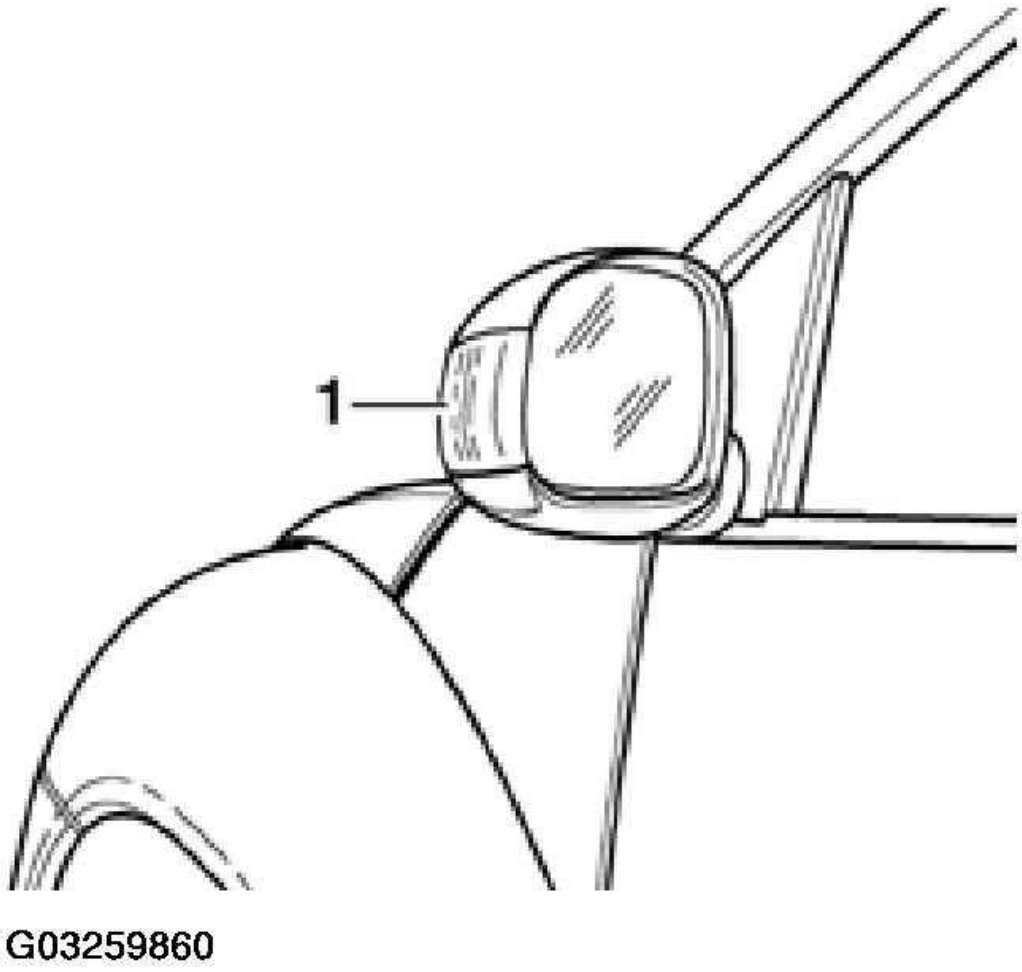


Fig. 1: Exploded View Of Ignition System Components (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Engine codes AVH, AZG, BDC, BEV, BGD

NOTE: The following list refers to items in Fig. 2 .

1. **H.T. cable**
   - 4...8 kohm
   - With suppression connector and spark plug connector
   - Check for continuity
   - Pull spark plug connector off with T10112.

2. **Ignition coils with final output stages -N70-, -N127-, -N291-, -N292-**
    - With marks for H.T. cables: HV1 = Cylinder 1, HV2 = Cylinder 2, HV3 = Cylinder 3, HV4 = Cylinder 4
3. **10 N.m**
4. **6-pin connector**
5. **Knock Sensor (KS) 1 -G61-**
    - Gold plated contacts
    - Location: Cylinder block intake side
6. **2-pin connector**
    - For KS 1 -G61-
    - Gold plated contacts
    - Do not interchange
7. **Knock Sensor (KS) 2 -G66-**
    - Gold plated contacts
    - Next to ignition transformer
8. **2-pin connector**
    - For KS2 -G66-
    - Gold plated contacts
    - Do not interchange
9. **20 N.m**
    - Torque setting influences the function of knock sensor
10. **Spark plug, 25 N.m**
    - Type and electrode gap. See **TEST DATA, SPARK PLUGS**
    - To remove and install pull off connectors for outer injectors
    - Remove and install with 3122 B
11. **Connector**
    - Gold plated contacts
    - 3-pin
12. **10 N.m**
13. **100 N.m**
    - Use counter support tool 3415 to loosen and tighten
14. **Camshaft pulley**
    - With rotor for camshaft position sensor
    - Removing and installing. See **VALVE GEAR, SERVICING**
15. **Camshaft Position (CMP) sensor -G40-**
16. **Retainer**
    - For camshaft position sensor

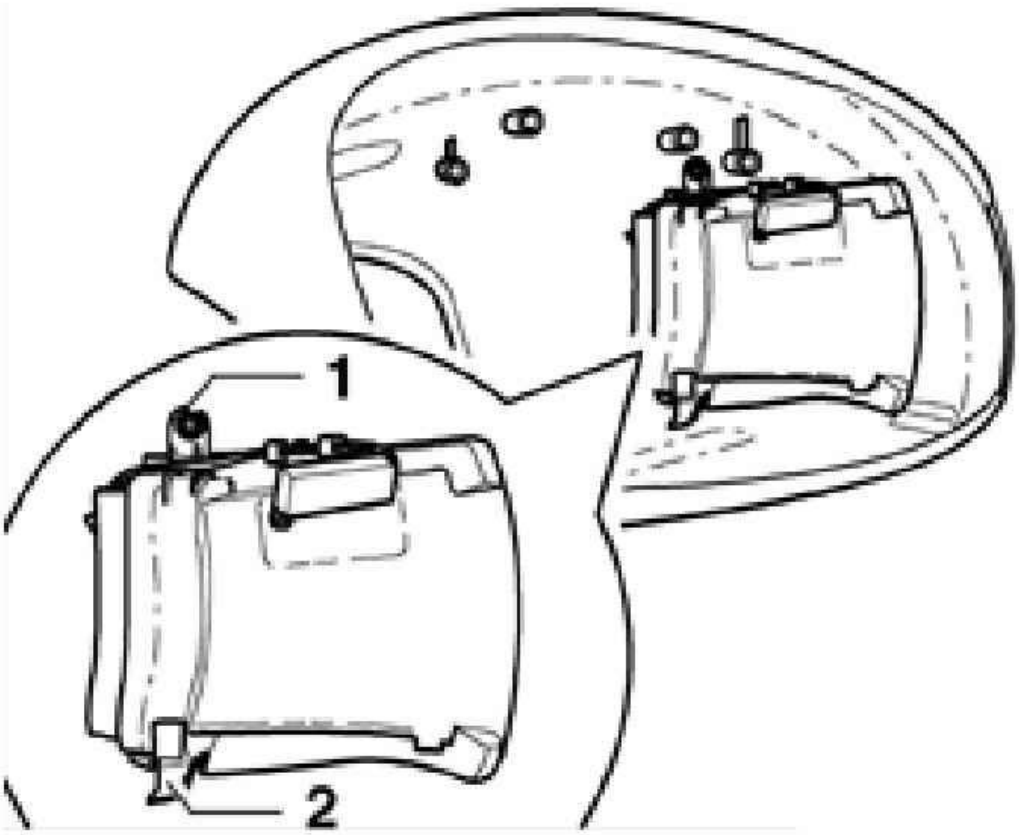


Fig. 2: Exploded View Of Ignition System Components (Engine Code AVH, AZG, BDC, BEV AND BGD)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

SAFETY PRECAUTIONS

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be observed:

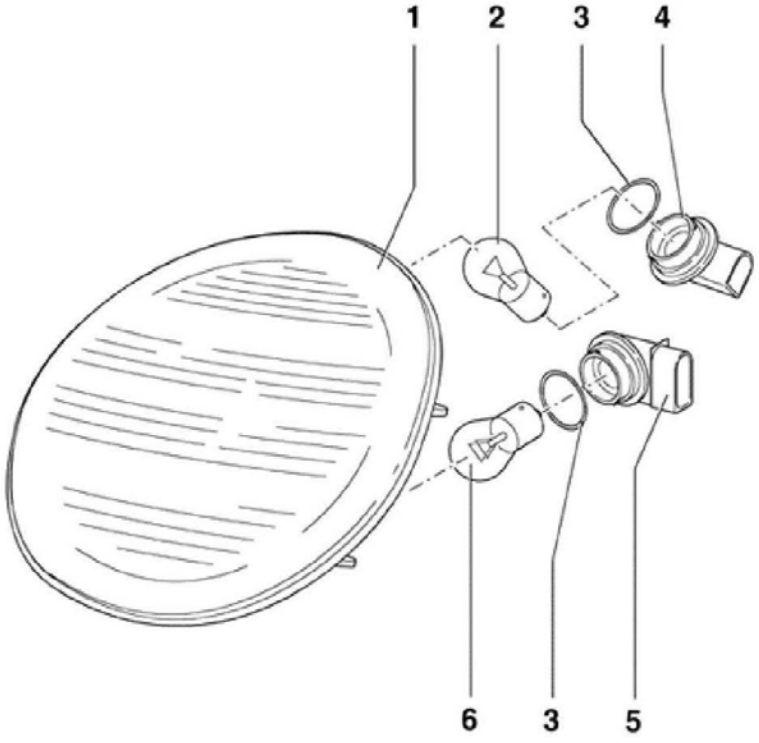
WARNING: When performing repair work, especially due to the confined conditions in the engine compartment, pay attention to the following:

- **Route all types of lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum) as well as electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

- Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- The ignition must be switched off before connecting or disconnecting injection or ignition system wiring or tester cables.
- If the engine is to be turned at starter speed, without starting:

Engine code AEG

- Disconnect 4-pin harness connector -1- from ignition coil power output stage -2-.



1 - Housing

2 - Turn signal bulb

3 - O-ring

4 - Bulb holder for turn signal

5 - Bulb holder for brake light and taillight

6 - Dual filament bulb for brake light and taillight

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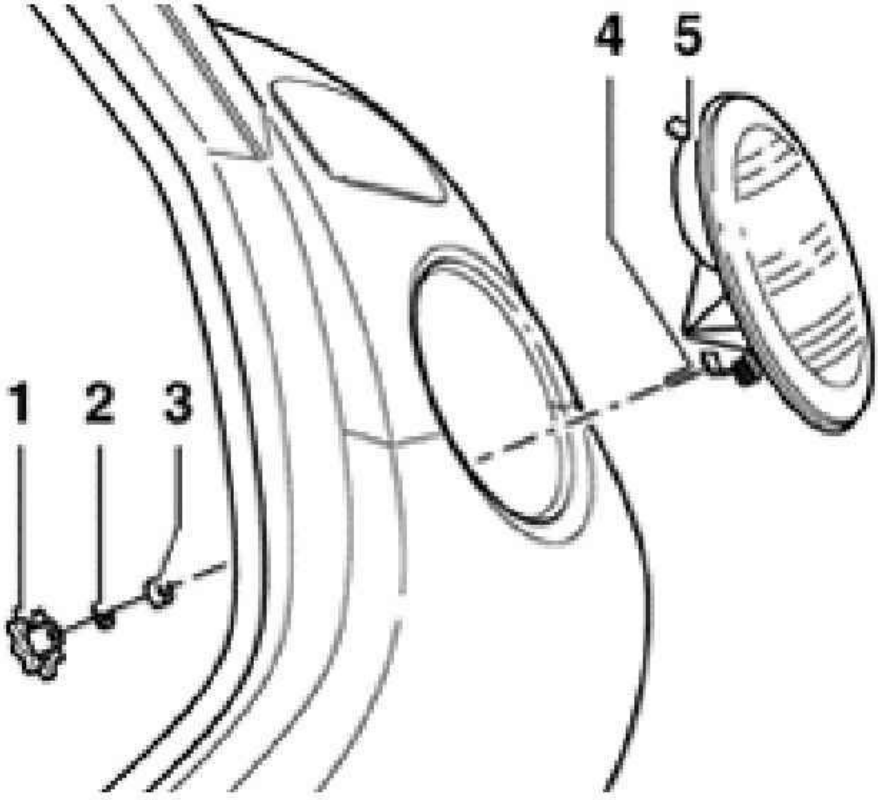
Fig. 3: Disconnecting Pin Harness Connector From Ignition Coil Power Output Stage (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Engine codes AVH, AZG, BDC, BEV, BGD

- Disconnect 6-pin connector from ignition coil with final output stage (arrow).



1 - Knurled nut

2 - Washer

3 - Spacer

4 - Retaining bolt

5 - Rear light

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Fig. 4: Disconnecting Pin Connector From Ignition Coil With Final Output Stage (Engine codes AVH, AZG, BDC, BEV, BGD)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all engines

- Pull fuse No. 32 out of fuse holder. Fuse holder is located under access panel at far left end of dash.

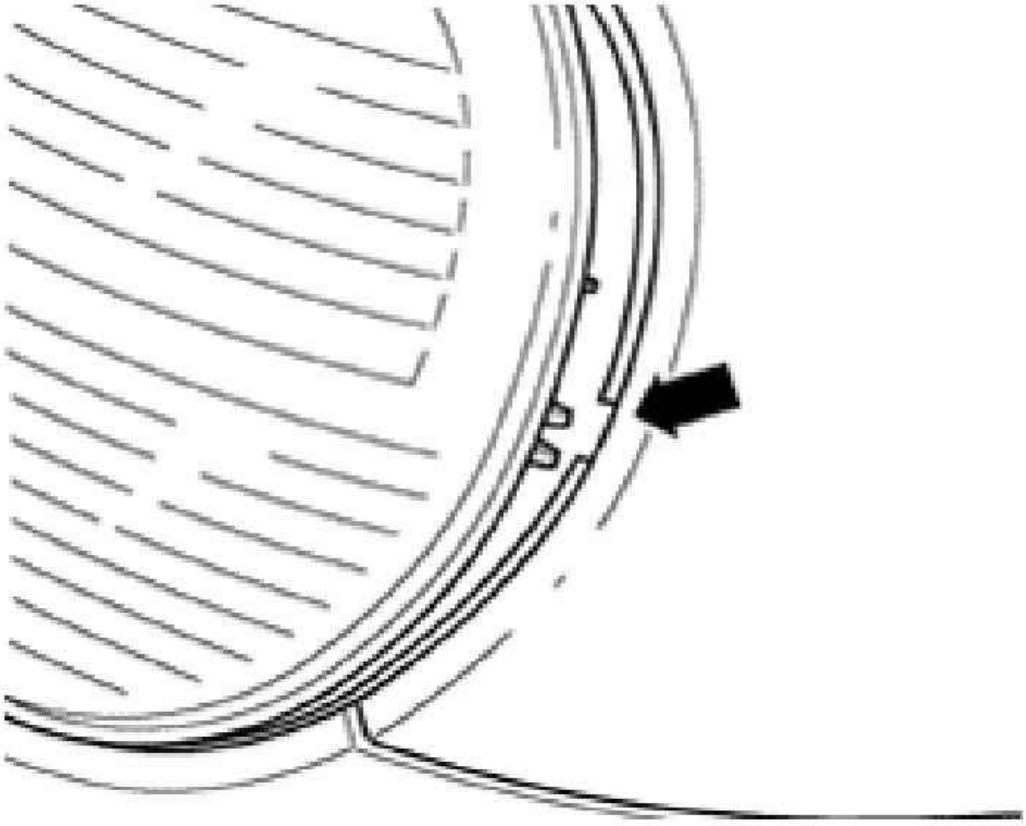

Fig. 5: Identifying Fuse No. 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Removing fuse 32 interrupts the voltage supply to the injectors.

Observe following if test and measuring instruments are required during a road test:

- Test and measuring instruments must be secured to rear seat and operated by an assistant from this

location.

If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

- Erase engine control module fault memory because pulling connectors off injector will have caused a fault to be recorded. See **ENGINE CONTROL MODULE FAULT MEMORY, INTERROGATING AND ERASING** .
- Generate readiness code if fault memory has been erased. See **COMPONENTS AND FUNCTIONS, ADAPTING** .

TEST DATA, SPARK PLUGS

SPARK PLUGS TEST DATA

Engine code	**AEG**	**AVH, AZG, BEV**	**BDC, BGD**
Firing order	1-3-4-2	1-3-4-2	1-3-4-2
Spark Plugs (1) , (2)			
VW	101 000 033 AA	101 000 062 AB	101 000 062 AB
Manufacturer's designation	BKR6ET-10	PZFR5D-11	PZFR 5D-11
Electrode gap	0.9 to 1.1 mm (0.035 to 0.043 in.)	1.0 to 1.1 mm	1.0 to 1.1 mm
Torque setting	30 N.m (22 ft lb)	25 N.m	25 N.m

(1) For spark plug change intervals, see maintenance schedule in owners manual.

(2) Use tool T10112 for disconnecting and connecting spark plug connector. Remove and install spark plugs using tool 3122B.

IGNITION GLOW PLUG SYSTEM

IGNITION, SERVICING

General notes on ignition system

- This section deals specifically with ignition - related components. The other components of the injection and ignition system, see **MULTIPORT FUEL INJECTION (MFI)** .
- For the electric components to work properly, a voltage of at least 11.5 V is required.
- The battery must only be disconnected and connected with the ignition switched off, since the Engine Control Module (ECM) can otherwise be damaged.
- The Engine Control Module (ECM) is equipped with an On Board Diagnostic (OBD)
- Components marked with * are tested via On Board Diagnostic (OBD), see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- It is possible that the control module will recognize a malfunction and store a DTC during some tests. Therefore the following work steps must be performed in the mentioned sequence after ending all tests and repairs.

- Check DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Erase DTC memory, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA**
- For completion, generate readiness code, see **READINESS CODE, GENERATING** .

Parts of ignition, removing and installing:

- Vehicles with engine code APH, see **PARTS OF THE IGNITION, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE APH)** .
- Vehicles with engine code AWP, AWV, see **PARTS OF THE IGNITION, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE AWP, AWV)** .
- Safety precautions, see **SAFETY PRECAUTIONS** .
- Test data, spark plugs, see **TEST DATA, SPARK PLUGS** .

Parts of the ignition, removing and installing (Vehicles with engine code APH)

The following list pertains to **Fig. 1** .

1. **Connector**
   - Black, 4-pin
2. **Ignition Coil 1 with Power Output Stage -N70-, Ignition Coil 2 with Power Output Stage -N127-, Ignition Coil 3 with Power Output Stage - N291-, Ignition Coil 4 with Power Output Stage -N292-**

- Checking, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**

3. **Seal**
   - Replace if damaged
4. **Spark plug, 30 Nm**
   - remove and install with 3122 B
   - Type and spark plug gap, see **TEST DATA, SPARK PLUGS**
5. **Connector**
   - black, 3-pin
6. **10 Nm**
7. **Camshaft Position (CMP) Sensor -G40-***
   - Checking, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
8. **25 Nm**
9. **Washer**
   - Conical
10. **Face plate**
    - For Camshaft Position (CMP) Sensor -G40-
    - note position when installing
11. **20 Nm**
    - Tightening torque affects function of Knock Sensor (KS)
12. **Knock Sensor (KS) 1 -G61-***
    - Terminals of sensor and connector are gold-plated
    - Checking, see **CHECK KNOCK SENSORS**
13. **3-pin harness connector**
    - Terminals are gold-plated
    - Brown for Knock Sensor (KS) 1 -G61-
14. **Ground (GND) wire**
    - Do not loosen or tighten unless ignition is switched off.
15. **10 Nm**
    - Do not loosen or tighten unless ignition is switched off.
16. **3-pin harness connector**
    - Terminals are gold-plated
    - Black for Knock Sensor (KS) 2 -G66-
17. **Knock Sensor (KS) 2 -G66-***
    - Terminals of sensor and connector are gold-plated
    - Checking, see **CHECK KNOCK SENSORS**

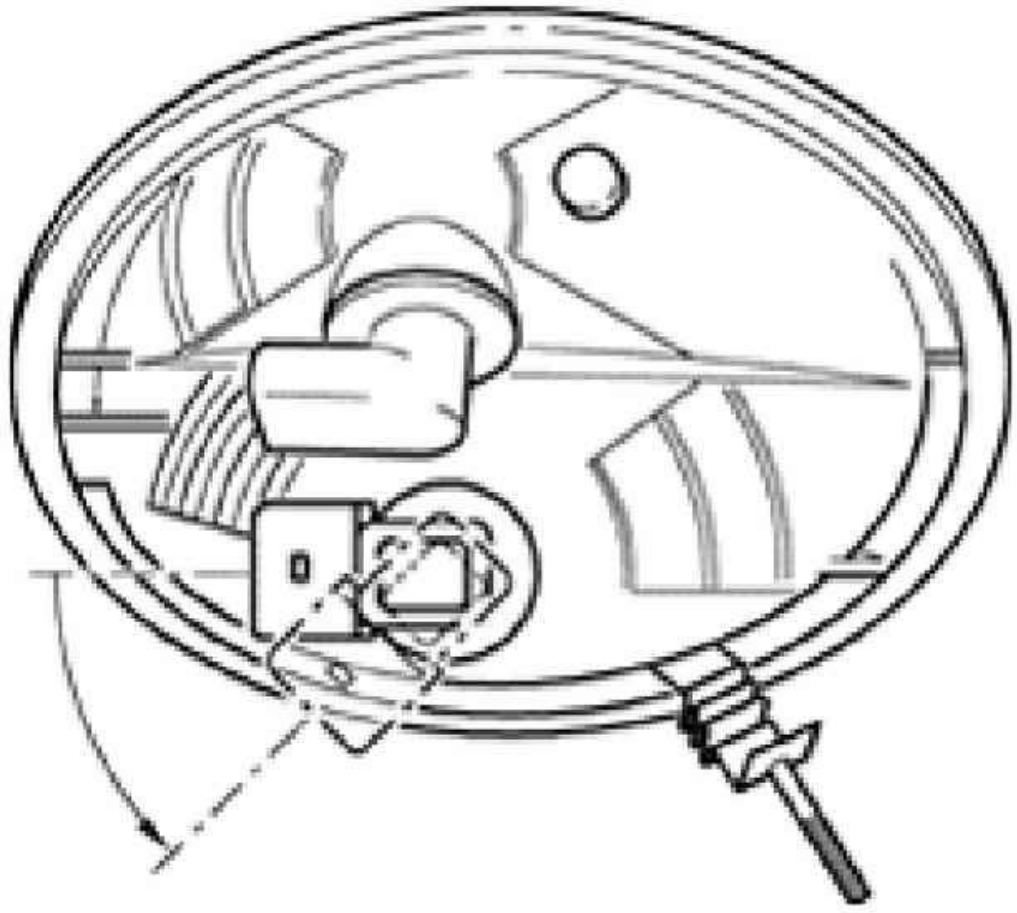

Fig. 1: Identifying Parts Of Ignition (Vehicles With Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Parts of the ignition, removing and installing (Vehicles with engine code AWP, AWV)

The following list pertains to **Fig. 2** .

1. **Connector**
   - Black, 4-pin
2. **Ignition Coil 1 with Power Output Stage -N70-, Ignition Coil 2 with Power Output Stage -N127-, Ignition Coil 3 with Power Output Stage -N291-, Ignition Coil 4 with Power Output Stage -N292-**
   - Checking, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**

3. **Snap ring**
    - for Ignition Coil 1 with Power Output Stage -N70-, Ignition Coil 2 with Power Output Stage -N127-, Ignition Coil 3 with Power Output Stage -N291-, Ignition Coil 4 with Power Output Stage -N292-
    - Replace if damaged
4. **Spark plug, 30 Nm**
    - remove and install with 3122 B
    - Type and spark plug gap, see **TEST DATA, SPARK PLUGS**
5. **Connector**
    - black, 3-pin
    - Terminals of sensor and connector are gold-plated
6. **10 Nm**
7. **Camshaft Position (CMP) Sensor -G40-***
    - Checking, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
8. **25 Nm**
9. **Washer**
    - Conical
10. **Face plate**
    - For Camshaft Position (CMP) Sensor -G40-
    - note position when installing
11. **20 Nm**
    - Tightening torque affects function of Knock Sensor (KS)
12. **Knock Sensor (KS) 1 -G61-***
    - Terminals of sensor and connector are gold-plated
    - Component location: Cylinder block, intake side
    - Checking, see **CHECK KNOCK SENSORS**
13. **Knock Sensor (KS) 2 -G66-***
    - Terminals of sensor and connector are gold-plated
    - Component location: Cylinder block, intake side
    - Checking, see **CHECK KNOCK SENSORS**
14. **Connector**
    - 2-pin
    - Terminals are gold-plated
    - Black for Knock Sensor (KS) 1 -G61-
    - Black for Knock Sensor (KS) 2 -G66-
    - Mark connector before removing
15. **Ground (GND) wire**
    - Do not loosen or tighten unless ignition is switched off.

16. **10 Nm**
    - Do not loosen or tighten unless ignition is switched off.

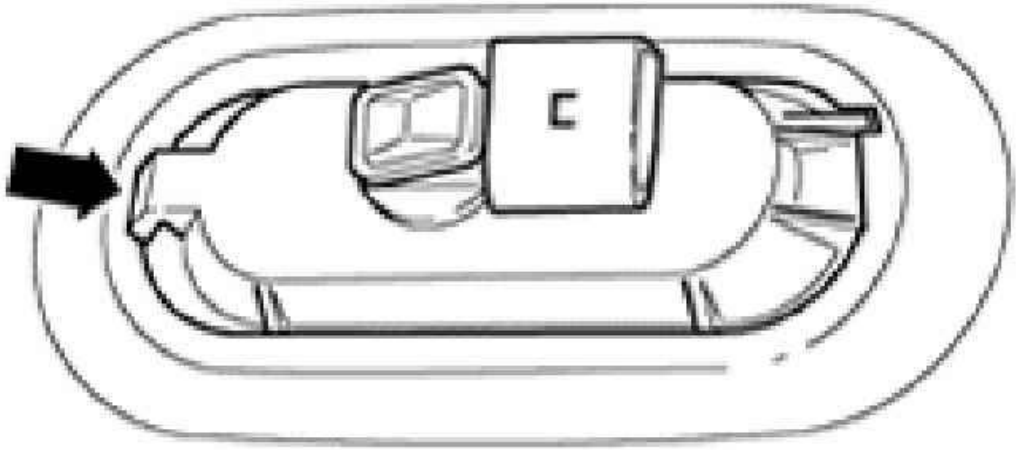

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Fig. 2: Identifying Parts Of Ignition (Vehicles With Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Camshaft adjustment, servicing (Vehicles with engine code AWP, AWV)

Cylinder head, removing and installing:

See **CYLINDER HEAD, REMOVING AND INSTALLING**

Valvetrain, servicing:

See **VALVE GEAR, SERVICING**

The following list pertains to **Fig. 3** .

1. **Double bearing cap**
2. **10 Nm**
3. **Exhaust camshaft bearing cap**
4. **Exhaust camshaft**
5. **Intake camshaft bearing cap**
6. **Intake camshaft**

7. **Drive chain**
    - Mark direction of travel (installation position) before removing
8. **Camshaft adjuster**
    - Check valves for camshaft adjustment, see **VALVE FOR CAMSHAFT ADJUSTMENT, CHECKING (VEHICLES WITH ENGINE CODE AWP, AWV)**
9. **10 Nm**
10. **Valve -1- for camshaft adjustment -N205-***
    - only together with camshaft adjuster item 8 , replacing
    - Checking, see **VALVE FOR CAMSHAFT ADJUSTMENT, CHECKING (VEHICLES WITH ENGINE CODE AWP, AWV)**
11. **Seal**
    - Rubber/metal seal
    - replace
12. **Seal**
    - replace
13. **Cylinder head**

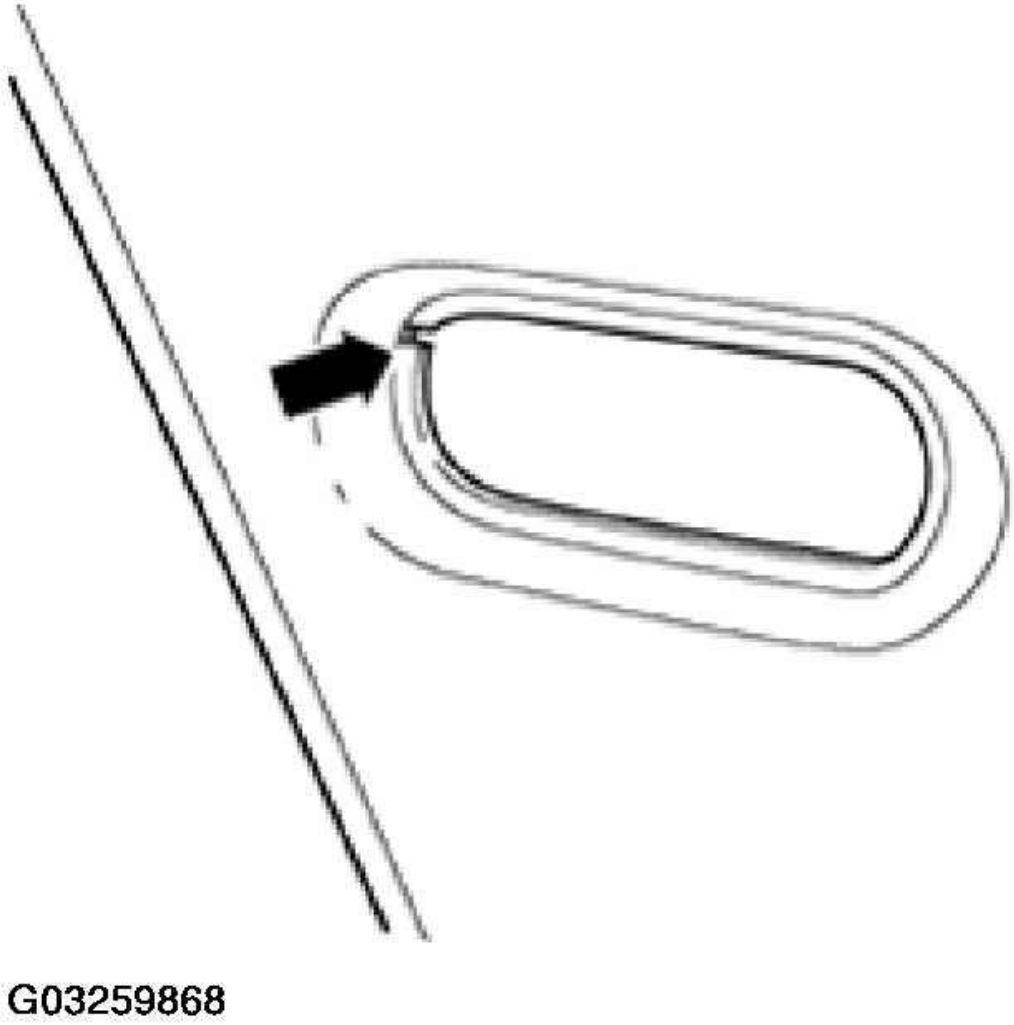

Fig. 3: Identifying Camshaft Adjustment, Servicing (Vehicles With Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Safety precautions

WARNING: Observe the following for all installations, especially in engine compartment due to lack of room:

- **Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.**

- **Watch for sufficient clearance to all moving or hot components.**

If test and measuring equipment is required during road test, note the following:

- Test equipment must always be secured to the rear seat and operated from there by a second person.

If test and measuring equipment is operated from the passenger seat, the person seated there could be injured in the event of an accident involving deployment of the passenger -side airbag.

To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:

- Do not touch or disconnect ignition wires when engine is running or turning at starting RPM.
- Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is switched off.
- If engine is to be cranked at starting RPM without starting:

Vehicles with engine code APH

- Disconnect all 4-pin connectors -2- from the ignition coils -1-.

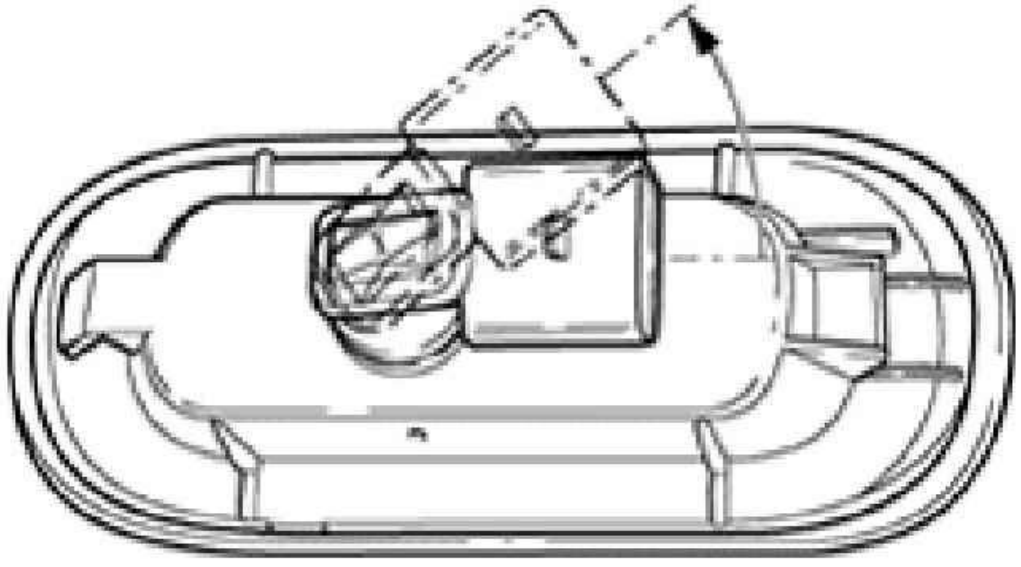

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Fig. 4: Disconnecting 4-Pin Connectors From Ignition Coils (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code AWP, AWV

- Disconnect all 4-pin connectors -2- from the ignition coils -1-.

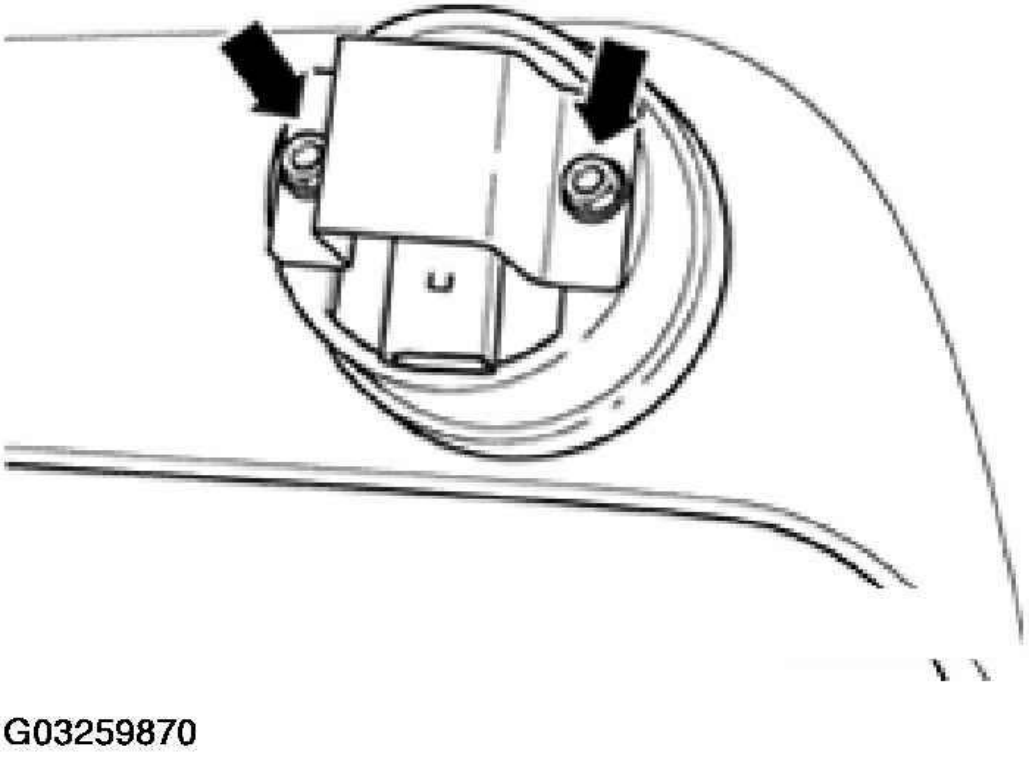


Fig. 5: Disconnecting 4-Pin Connectors From Ignition Coils (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

- Remove fuse 32

NOTE: By removing fuse 32, voltage supply to the fuel injectors is interrupted. Fuse holder is located behind access panel at far left end of dash.

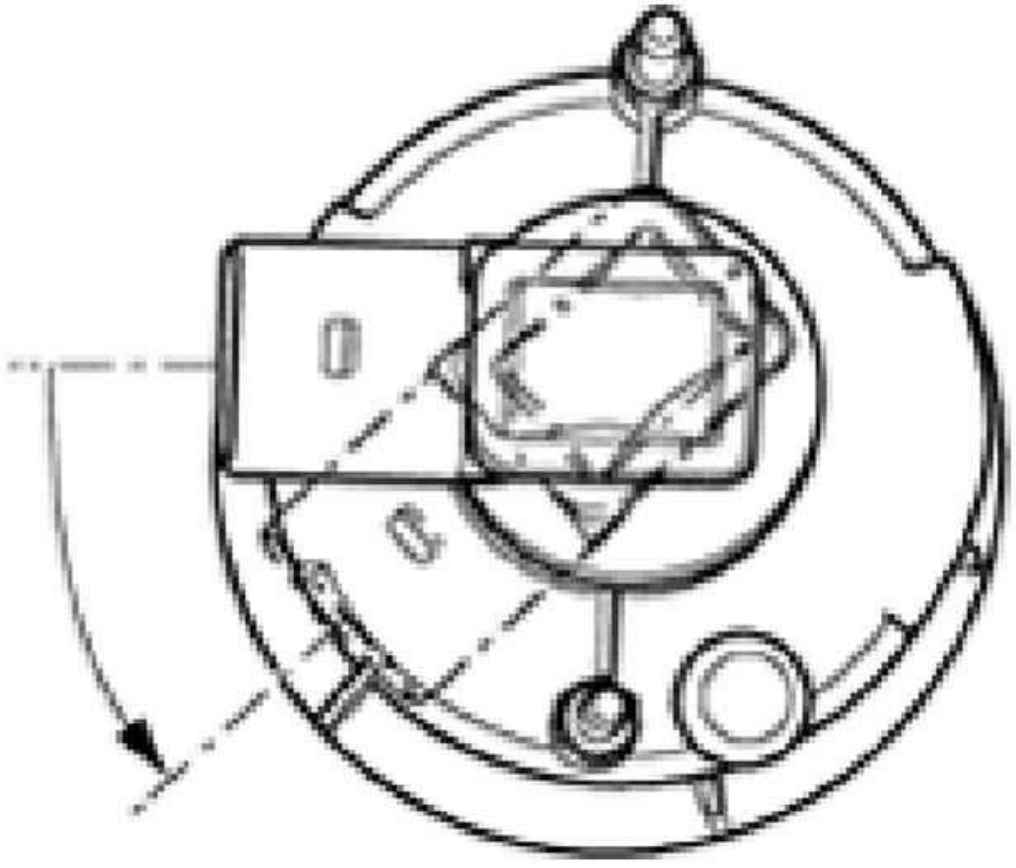


Fig. 6: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test Data, Spark Plugs

TEST DATA, SPARK PLUGS SPECIFICATIONS

Engine code	APH	AWP	AWV
Ignition sequence	1-3-4-2	1-3-4-2	1-3-4-2
Spark plugs			
VW/Audi	101,000,063 AA	101,000,063 AA	101,000,063 AA
Manufacturer code	PFR 6 Q	PFR 6 Q	PFR 6 Q
Tightening torque	30 Nm	30 Nm	30 Nm
Spark plug gap	max. 0.8 mm	max. 0.8 mm	max. 0.8 mm

Engine Control Module (ECM)[1]			
System identification	Motronic ME7.5	Motronic ME7.5	Motronic ME7.5
Terminals at Engine Control Module (ECM)	121	121	121
Part number	See Parts Catalog	See Parts Catalog	See Parts Catalog
Engine speed (RPM) limitation RPM	from approx. 6500	from approx. 6800	from approx. 6800

(1) Replacing Engine Control Module (ECM), see **REPLACING ENGINE CONTROL MODULE (ECM).**

Check Camshaft Position (CMP) sensor

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- The respective fuses of Motronic Engine Control Module (ECM) -J220- must be OK. Fuse holder is located behind access panel at far left end of dash.

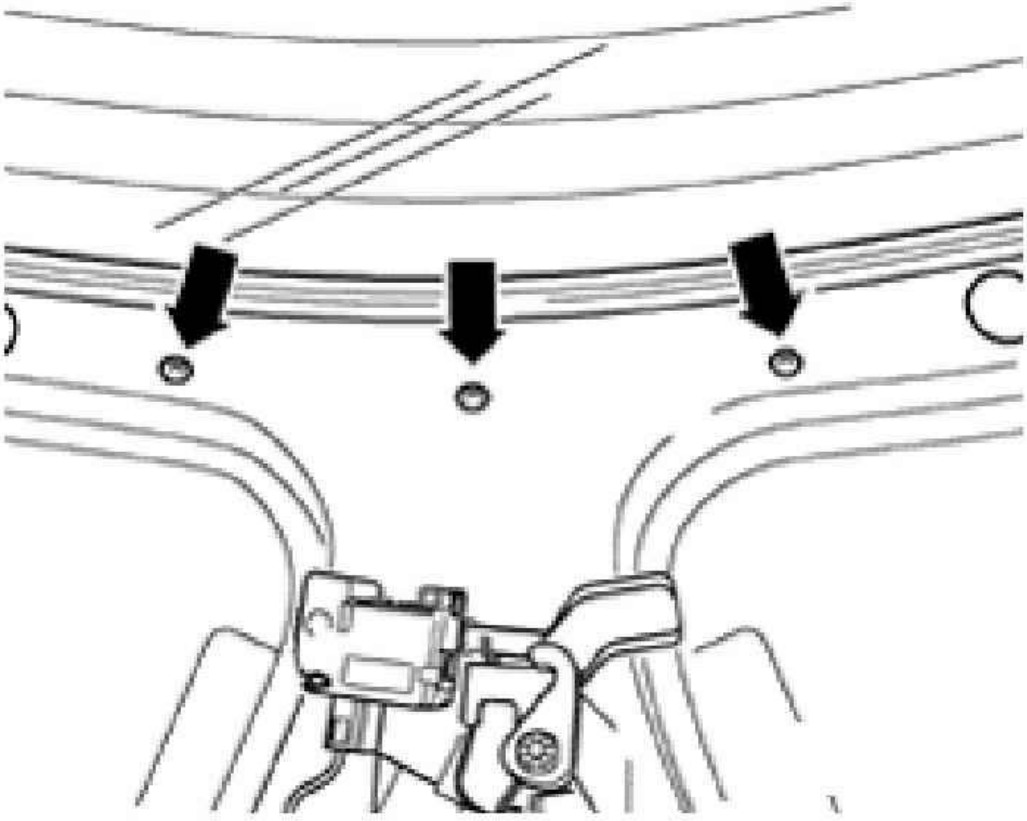


Fig. 7: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- Ground (GND) connections between engine and chassis must be OK.

Test sequence

- Disconnect 3-pin connector -1- from Camshaft Position (CMP) sensor -2-.

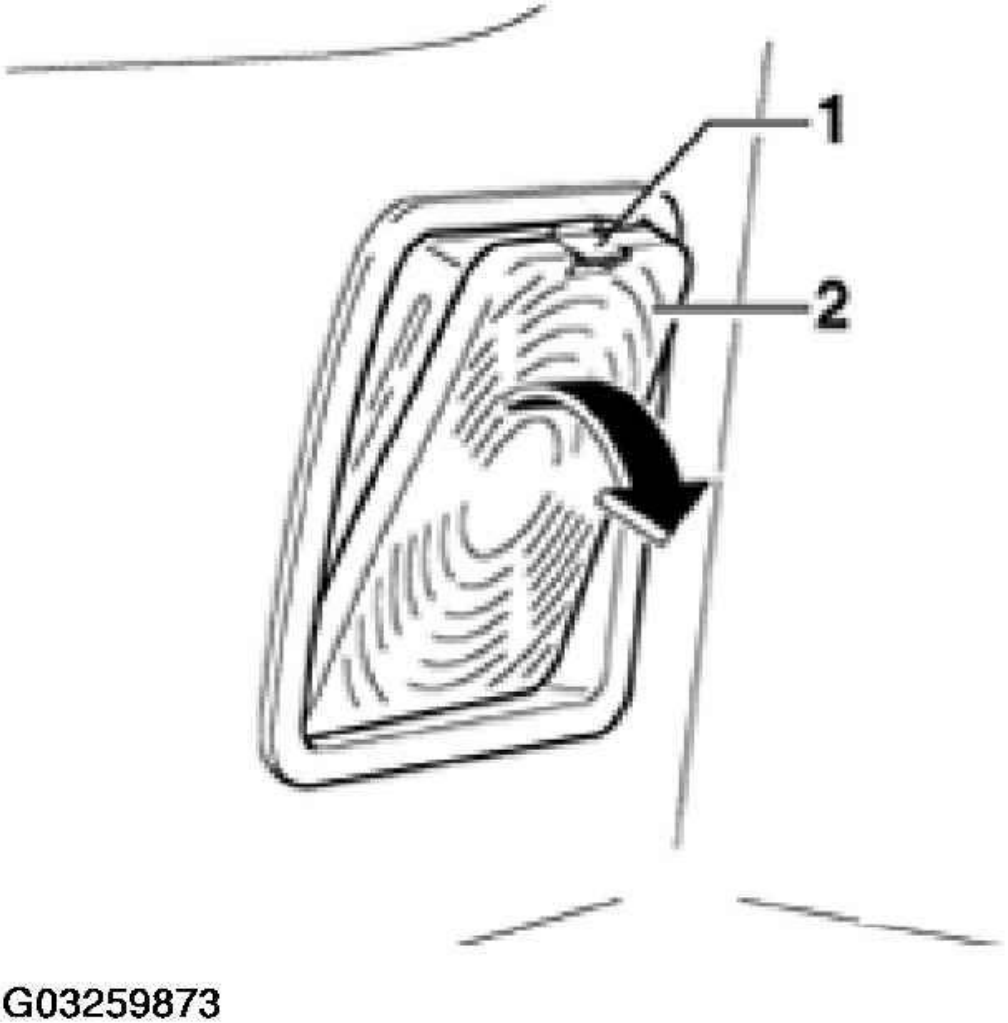


Fig. 8: Disconnecting 3-Pin Connector From Camshaft Position (CMP) Sensor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect multimeter to terminal 1 (B+) and 3 (Ground -GND-) of the respective connector for Camshaft Position (CMP) sensor for voltage measurement.
- Switch ignition on.

  Specified value: at least 4.5 V

- Switch ignition off.

If there is no voltage:

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Check for open circuits in wires between test box and connector according to wiring diagram.

  Terminal 1+socket 98

  Terminal 2+socket 86

  Terminal 3 + socket 108

  Wire resistance: max. 1.5 ohm

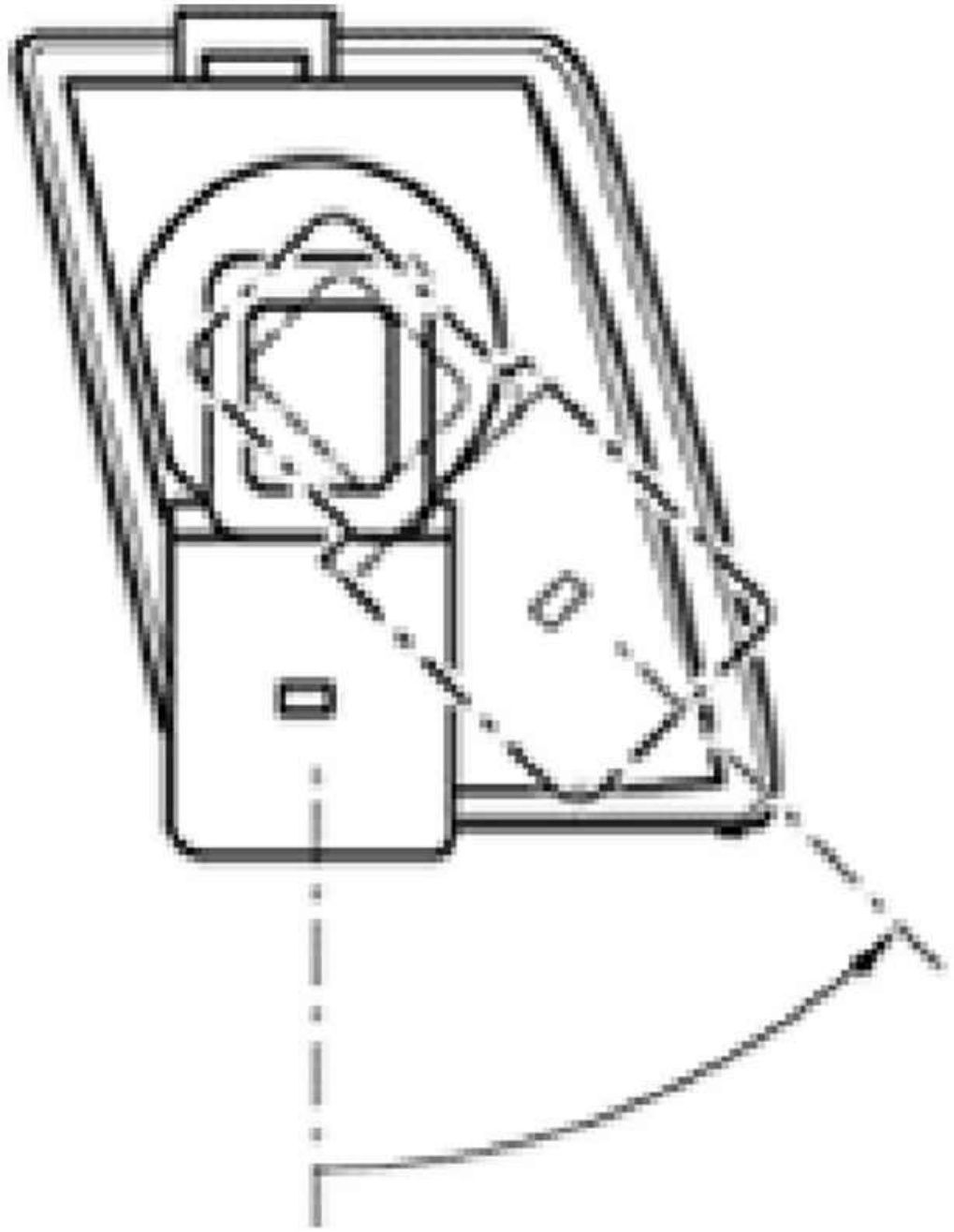


Fig. 9: Identifying CMP Sensor 3-Pin Harness Connector Terminals

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to each other.

  Specified value:INFINITY ohm

  If no malfunctions are found in the wires and there was voltage between terminals 1 + 3:

- Replace Camshaft Position (CMP) sensor:
  - Vehicles with engine code APH, see item 7 .
  - Vehicles with engine code AWP, AWV, see item 7 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

  If no malfunctions are found in wires and there was no voltage between terminals 1 + 3:

- Replace Engine Control Module (ECM), see **REPLACING ENGINE CONTROL MODULE (ECM)** .

Ignition coils with power output stages, checking

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1527 voltage test lamp
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- Respective fuses must be OK.
- Fuel Pump (FP) Relay -J17- must be OK. Fuse box is located behind access panel at far left end of dash.

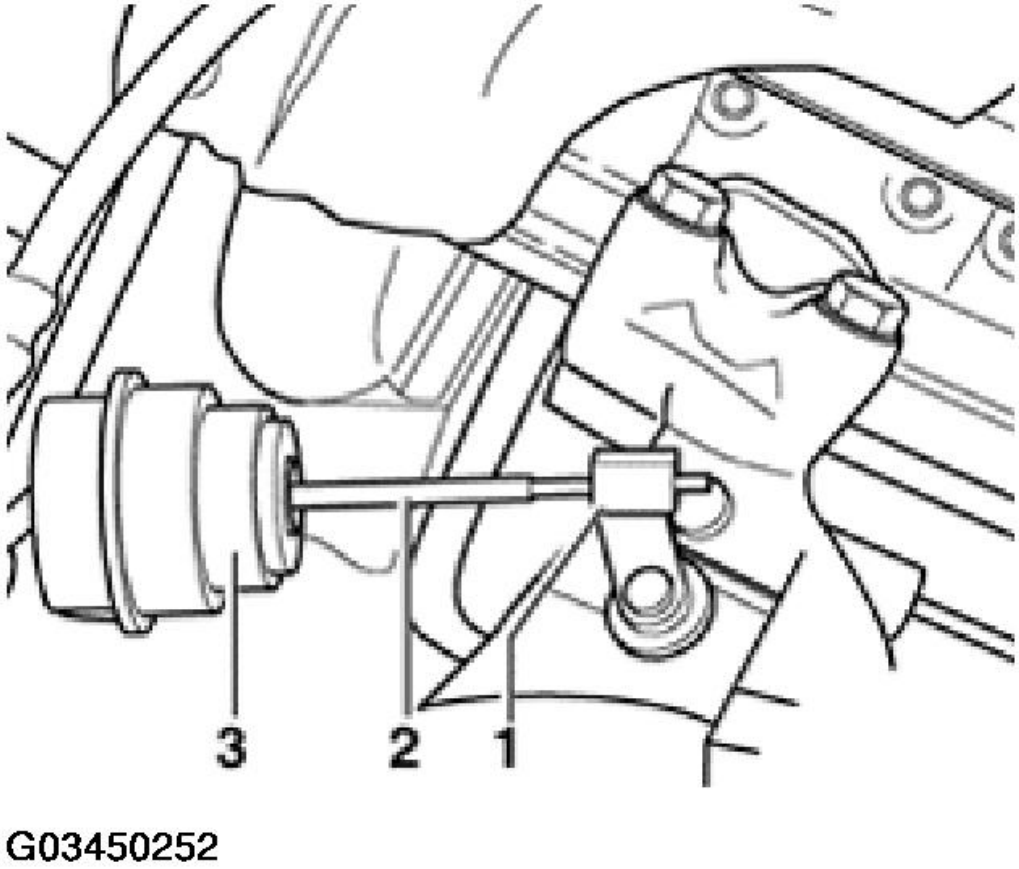


Fig. 10: Identifying Fuses Box
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- If vehicle is equipped with an A/C system, it must be switched off.

- Ground (GND) connections between engine and chassis must be OK.
- Engine speed (RPM) sensor must be OK, checking, see **CHECK ENGINE SPEED (RPM) SENSOR** .
- Camshaft Position (CMP) sensors must be OK, checking, see **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
- Ignition switched off.

Test sequence

Checking voltage supply

Vehicles with engine code APH

- Disconnect 4-pin connector -2- from ignition coil -1- to be checked.

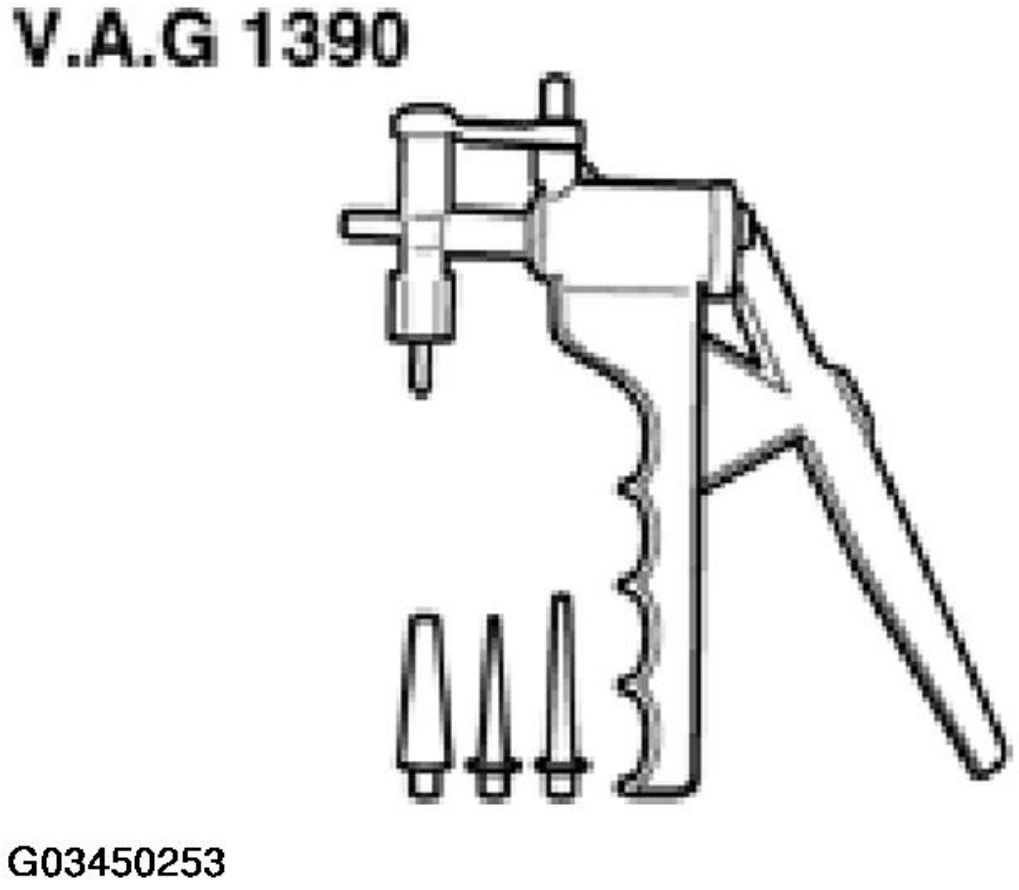


Fig. 11: Disconnecting 4-Pin Connector From Ignition Coil (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure supply voltage between terminals 1 + 2 and 1 + 4 of disconnected connector using the multimeter.
- Switch on ignition.

  Specified value: at least 11.5 V

- Switch ignition off.

  If there is no voltage:

- Check wire between 4 -pin connector terminal 1 and Motronic Engine Control Module (ECM) Power Supply Relay (main relay) for open circuit according to wiring diagram.

  Wire resistance: max. 1.5 ohm

- Check wires between 4 -pin connector and Ground (GND) for open circuit according to wiring diagram.

  Terminal 2 and Ground (GND)

  Terminal 4 and Ground (GND)

  Wire resistance: max. 1.5 ohm

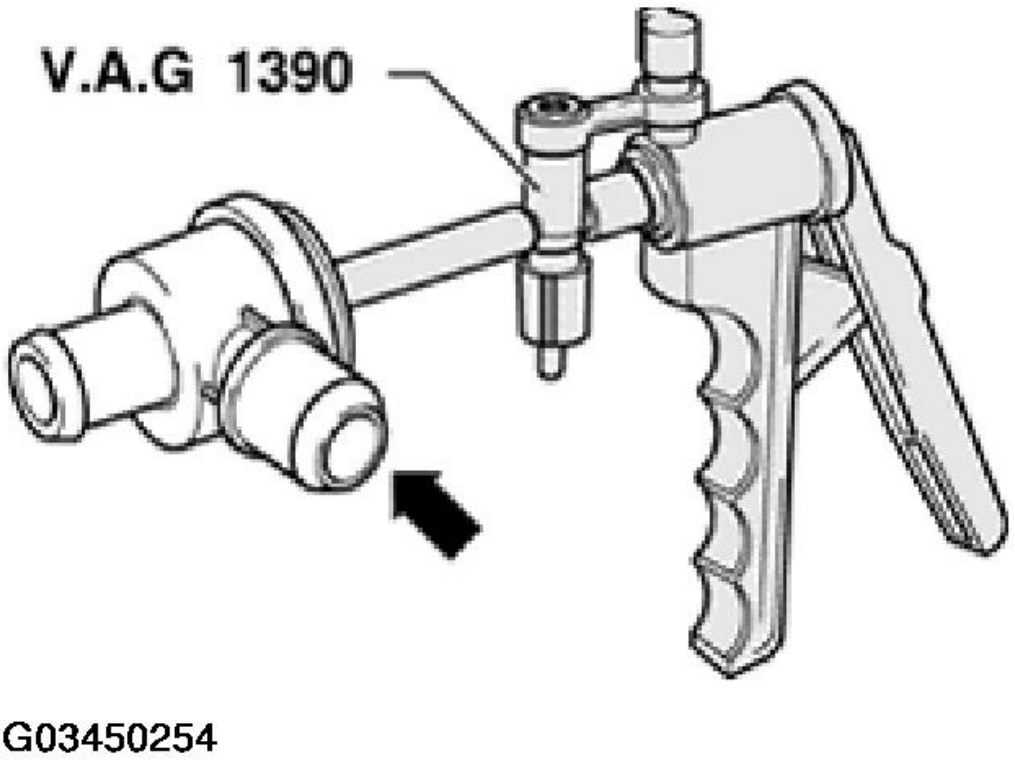


Fig. 12: Identifying 4-Pin Harness Connector Terminals (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code AWP, AWV

- Disconnect 4-pin connector -2- from ignition coil -1- to be checked.

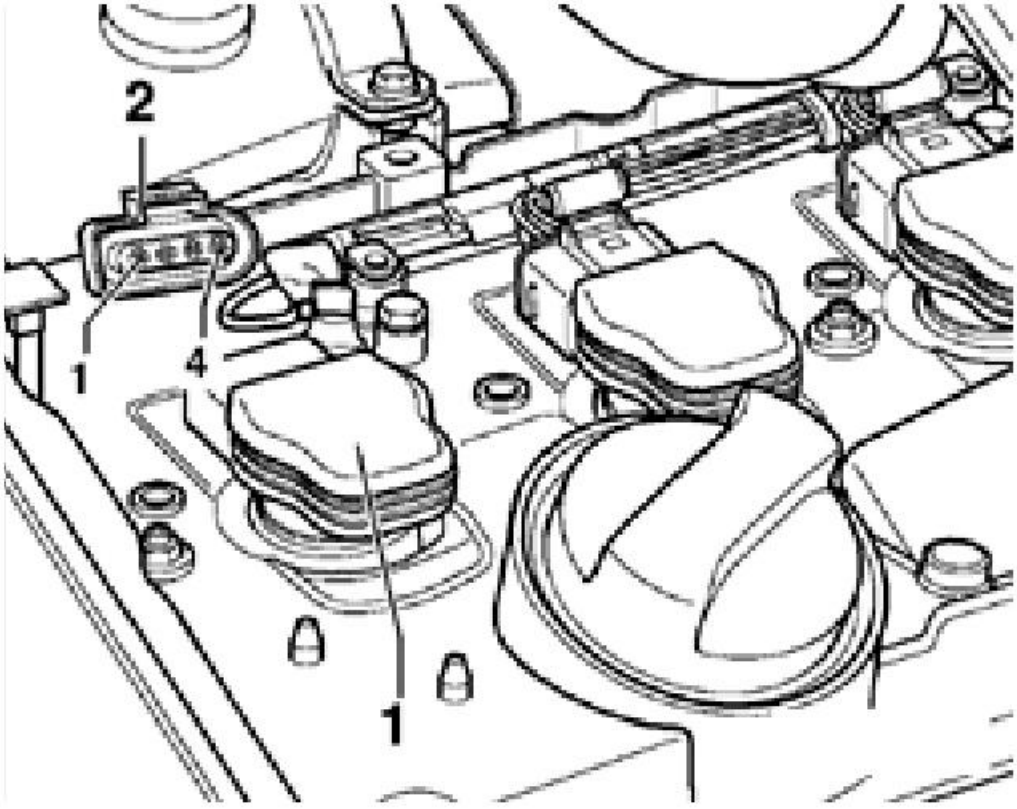


Fig. 13: Disconnecting 4-Pin Connector From Ignition Coil (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure supply voltage between terminals 1 + 2 and 1 + 4 of disconnected connector using the multimeter.
- Switch on ignition.

  Specified value: at least 11.5 V

- Switch ignition off.

  If there is no voltage:

- Check wire between 4 -pin connector terminal 1 and Motronic Engine Control Module (ECM) Power Supply Relay (main relay) for open circuit according to wiring diagram.

  Wire resistance: max. 1.5 ohm

- Check wires between 4 -pin connector and Ground (GND) for open circuit according to wiring diagram.

  Terminal 2 and Ground (GND)

  Terminal 4 and Ground (GND)

  Wire resistance: max. 1.5 ohm

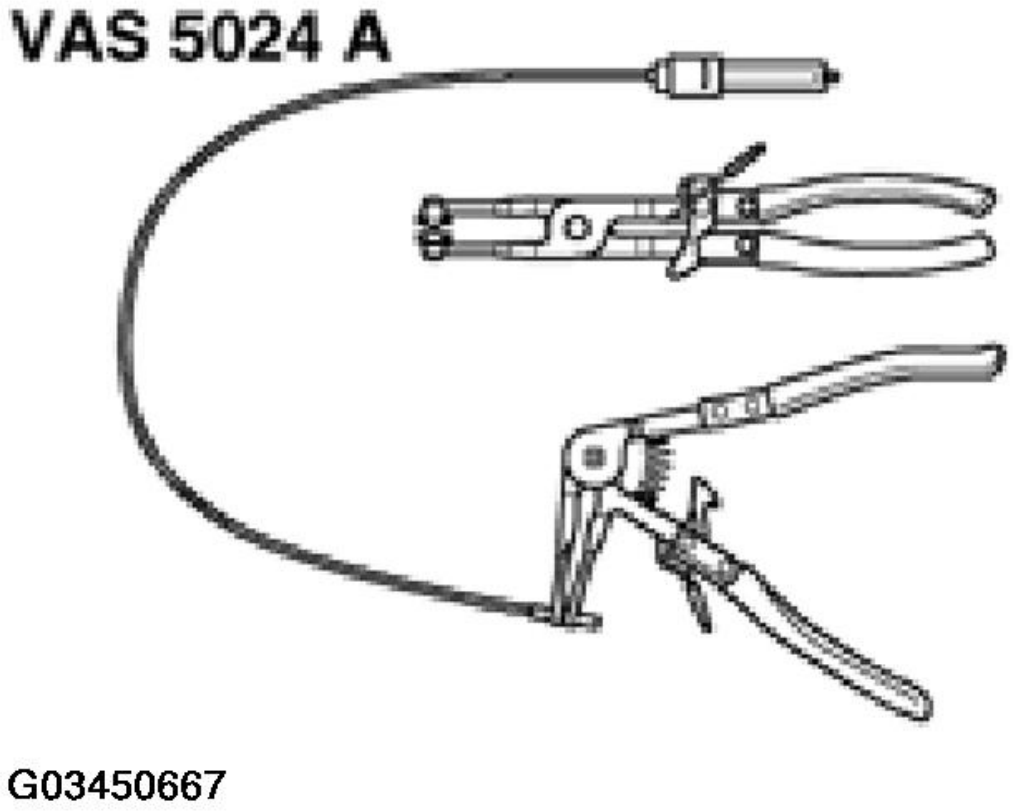


Fig. 14: Identifying 4-Pin Harness Connector Terminals (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

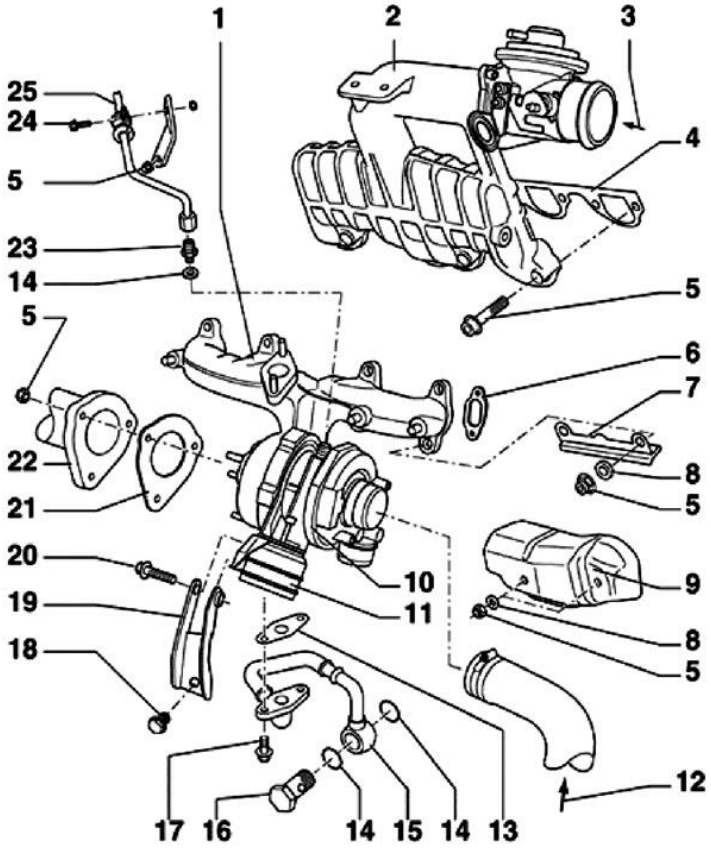
If there is no malfunction in voltage supply:

- Check activation, see **CHECKING ACTIVATION**

Checking activation

- Remove fuse 32

NOTE: By removing fuse 32, voltage supply to the fuel injectors is interrupted. Fuse box is located behind access panel at far left end of dash.



1 - Exhaust manifold
2 - Intake manifold
3 - From charge air cooler
4 - Gasket
5 - 25 Nm
6 - Gasket
7 - Bracket
8 - Washer
9 - Heat shield
10 - Turbocharger
11 - Vacuum diaphragm
12 - From air filter
13 - Gasket
14 - Seal
15 - Oil return line
16 - Banjo fitting, 40 Nm
17 - 15 Nm
18 - 40 Nm
19 - Brace
20 - 25 Nm
21 - Gasket
22 - Front exhaust pipe
23 - Connecting piece
24 - 10 Nm
25 - Oil supply line

G03450668

Fig. 15: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code APH

- Connect diode test lamp to

  terminals 2 + 3 of disconnected connector.

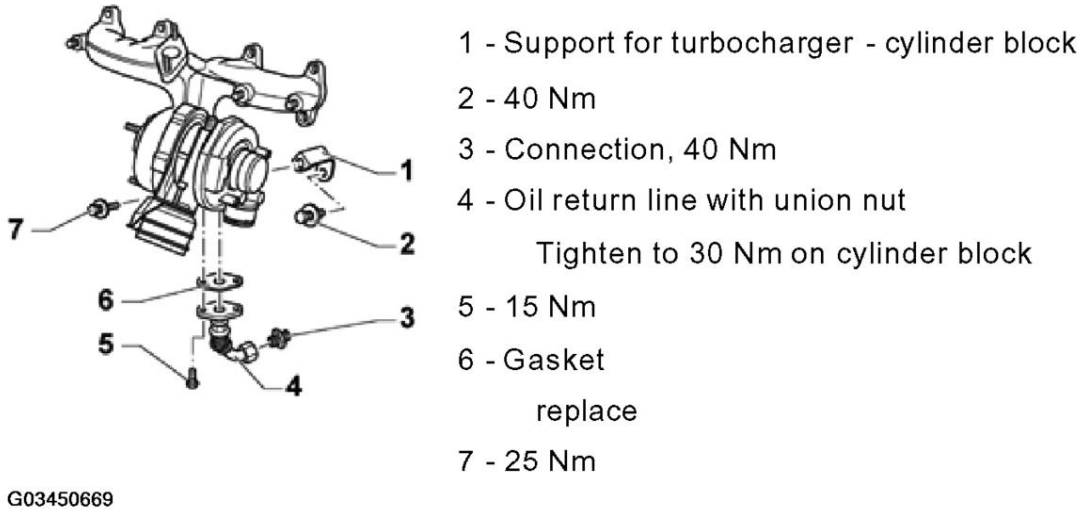


Fig. 16: Identifying 4-Pin Harness Connector Terminals (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code AWP, AWV

- Connect diode test lamp to

  terminals 2 + 3 of disconnected connector.

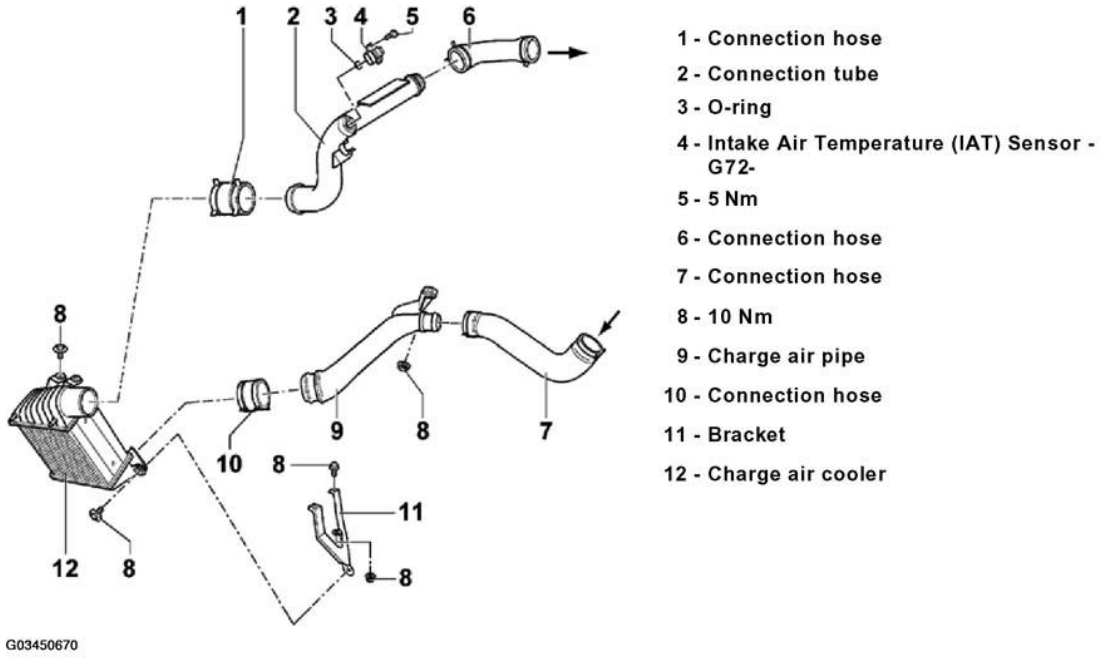

1 - Connection hose
2 - Connection tube
3 - O-ring
4 - Intake Air Temperature (IAT) Sensor - G72-
5 - 5 Nm
6 - Connection hose
7 - Connection hose
8 - 10 Nm
9 - Charge air pipe
10 - Connection hose
11 - Bracket
12 - Charge air cooler
G03450670

Fig. 17: Identifying 4-Pin Harness Connector Terminals (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

- Operate starter and test ignition signal from Engine Control Module (ECM).

  LED should flicker.

- Switch ignition off.

  If LED flickers and voltage supply is OK:

- Replace ignition coils with power output stage:
  - Vehicles with engine code APH, see item 2 .
  - Vehicles with engine code AWP, AWV, see item 2 .
  - Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

  If LED does not flicker:

- Check wires, see **CHECKING WIRING**

Checking wiring

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .

Vehicles with engine code APH

- Check wires between test box and 4-pin connector for open circuit according to wiring diagram.

  Cylinder 1 terminal 3 + socket 102

  Cylinder 2 terminal 3 + socket 95

  Cylinder 3 terminal 3 + socket 103

  Cylinder 4 terminal 3 + socket 94

  Wire resistance: max. 1.5 ohm

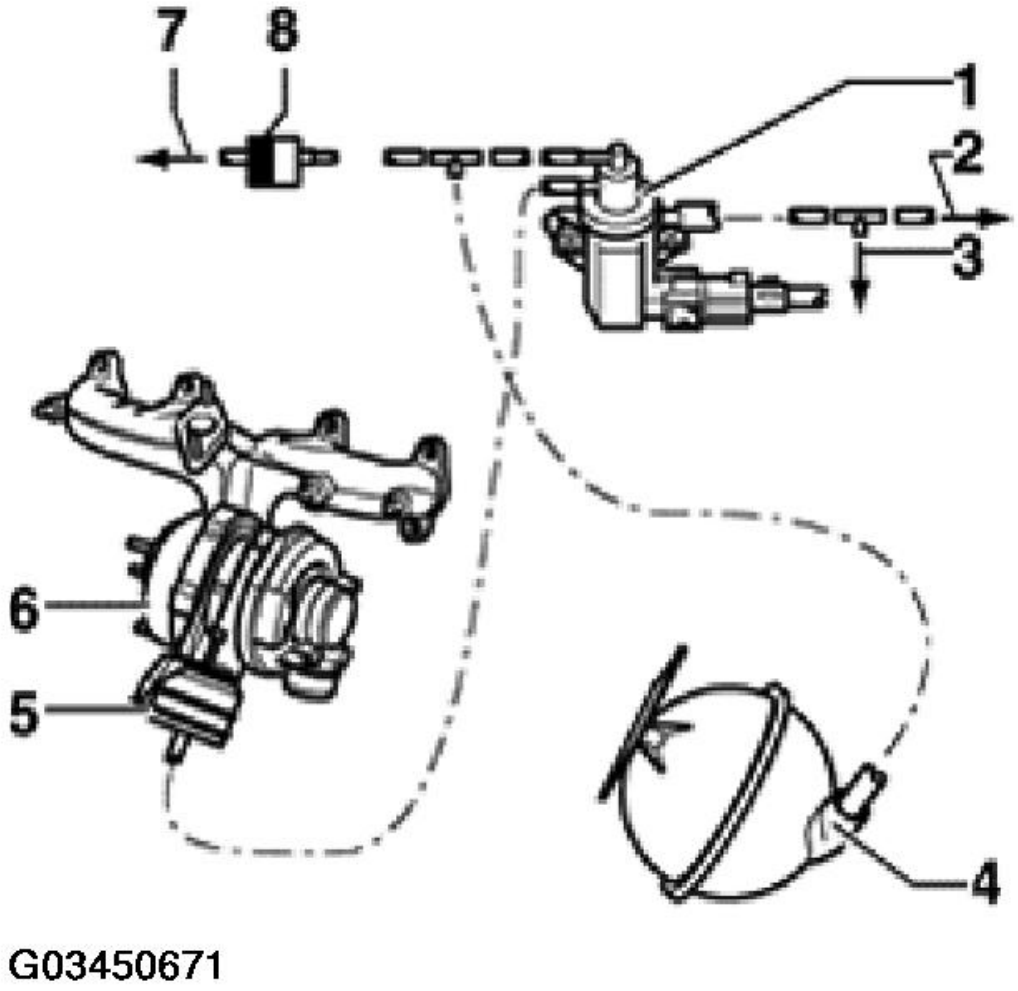


Fig. 18: Identifying 4-Pin Harness Connector Terminals (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code AWP, AWV

- Check wires between test box and 4-pin connector for open circuit according to wiring diagram.

  Cylinder 1 terminal 3 + socket 102

  Cylinder 2 terminal 3 + socket 95

  Cylinder 3 terminal 3 + socket 103

Cylinder 4 terminal 3 + socket 94

Wire resistance: max. 1.5 ohm

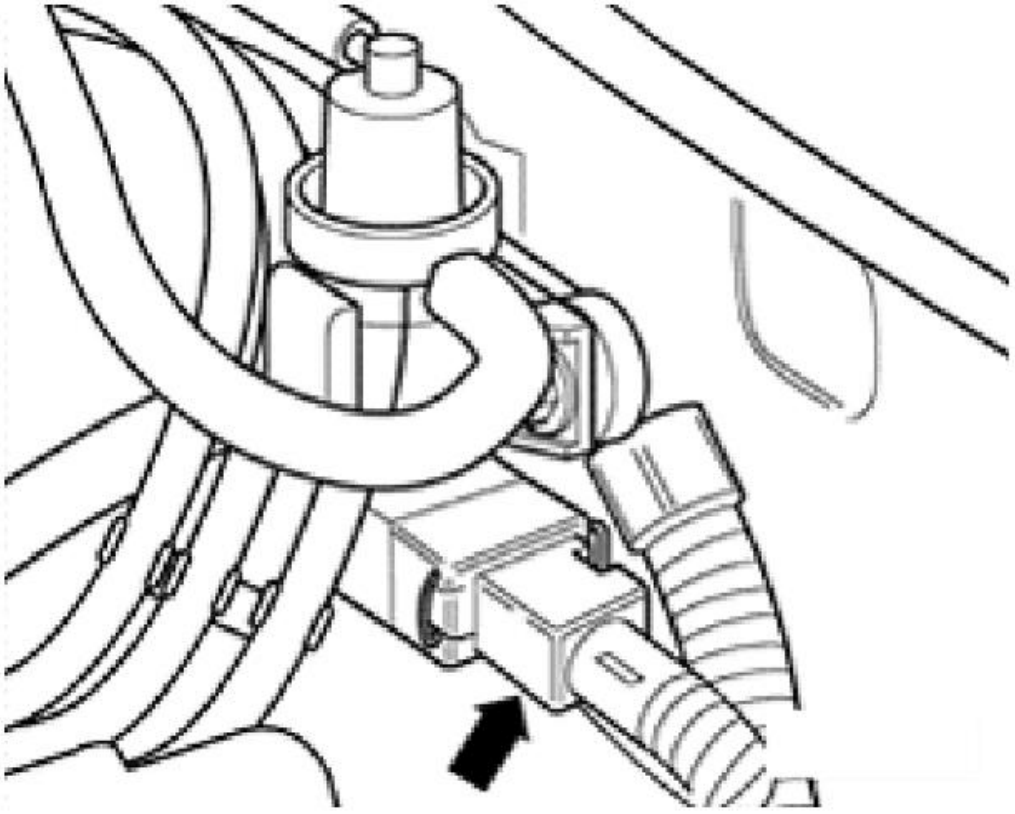


Fig. 19: Identifying 4-Pin Harness Connector Terminals (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

- Check wires for short circuit to each other.

If there is no malfunction in wire connections:

- Replace Engine Control Module (ECM), see **REPLACING ENGINE CONTROL MODULE (ECM)** .

Check knock sensors

- Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.
- For the Knock Sensors to function properly, it is important for tightening torque to be exactly 20 Nm.
- Use only gold-plated terminals when servicing terminals in harness connector of knock sensors.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- Knock sensor securing bolt tightened to 20 Nm.
- On Board Diagnostic (OBD) must have recognized a malfunction at one or both of the Knock Sensors (KS).
- Ignition switched off.

Checking resistance values of knock sensors

Vehicles with engine code APH

- Disconnect 2-pin harness connector to Knock Sensor (KS) 1 -G61-(-1-) and/or 2 -pin harness connector to Knock Sensor (KS) 2 -G66-(-2-).

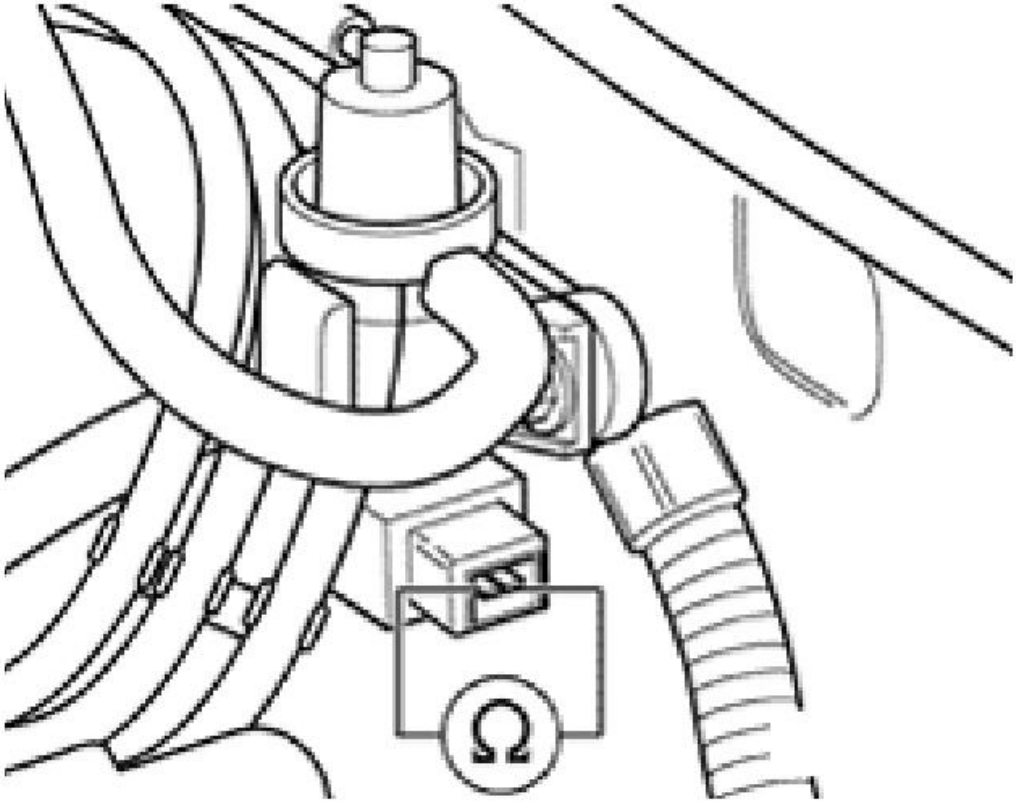


Fig. 20: Disconnecting 2-Pin Harness Connector To Knock Sensor (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance from knock sensor between terminal 1 (signal) and terminal 2 (Ground -GND-).

  Specified value: INFINITY ohm

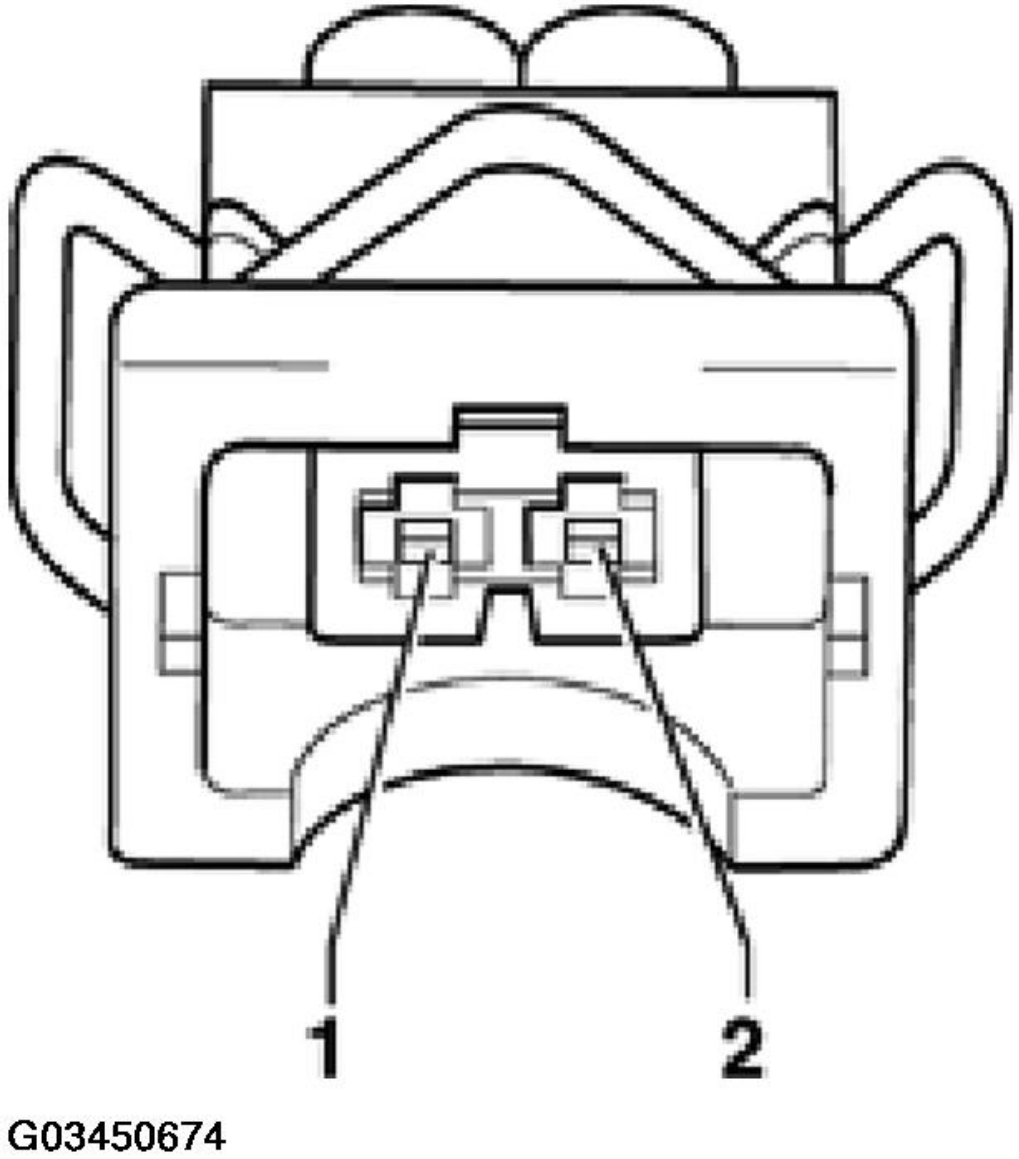


Fig. 21: Measuring Resistance Between Knock Sensor Terminal 1 (Signal) And Terminal 2 (Ground -Gnd-) - Engine Code APH
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If specified value is not obtained:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-, see item 12 .

    - Knock Sensor (KS) 2 -G66-, see item 17 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

Vehicles with engine code AWP, AWV

- Disconnect 2-pin harness connector to Knock Sensor (KS) 1 -G61-(-1-) and/or 2 -pin harness connector to Knock Sensor (KS) 2 -G66-(-2-).

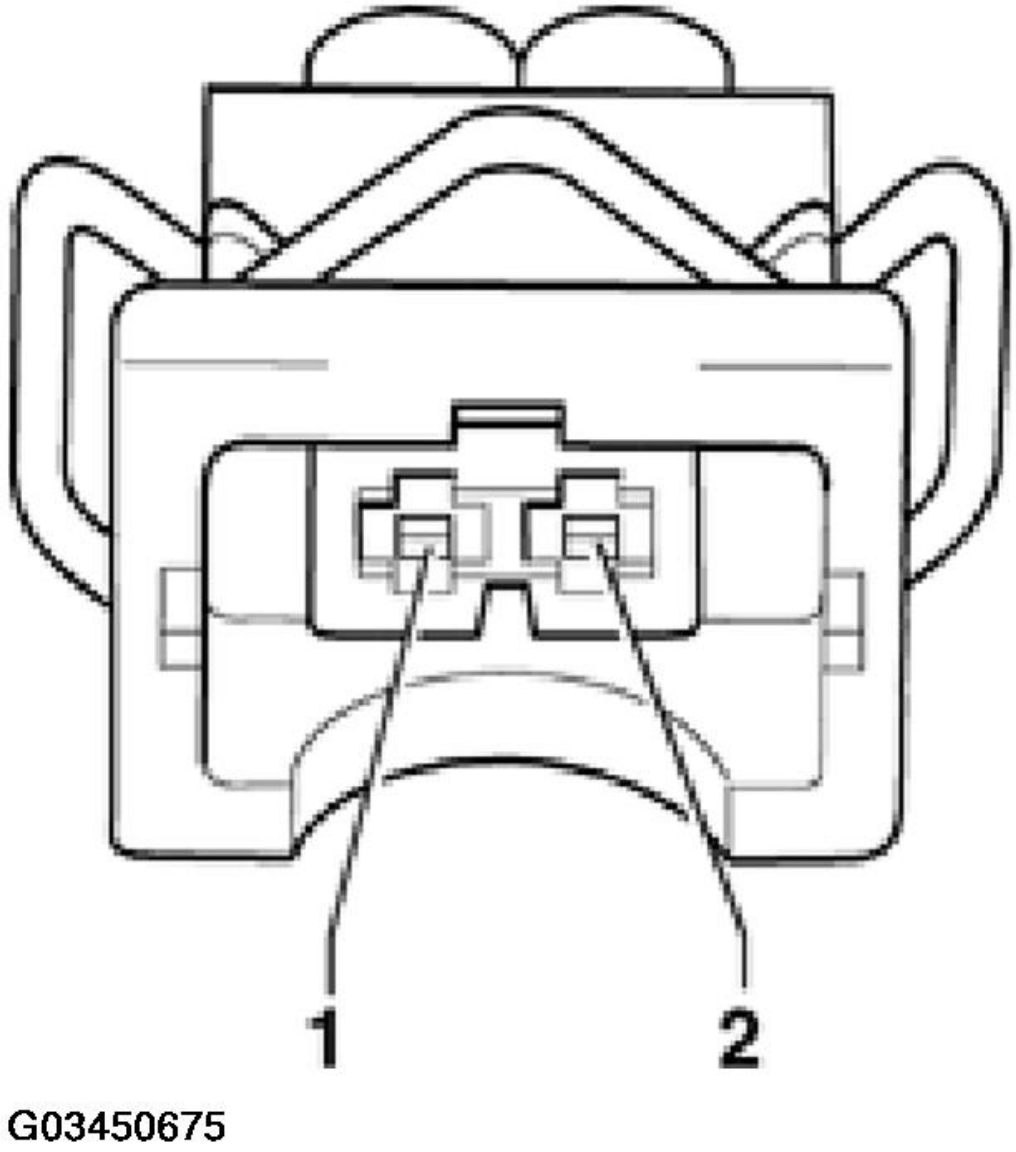


Fig. 22: Disconnecting 2-Pin Harness Connector To Knock Sensor (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between terminals 1 + 2 at connectors to knock sensors.

  Specified value: ohm

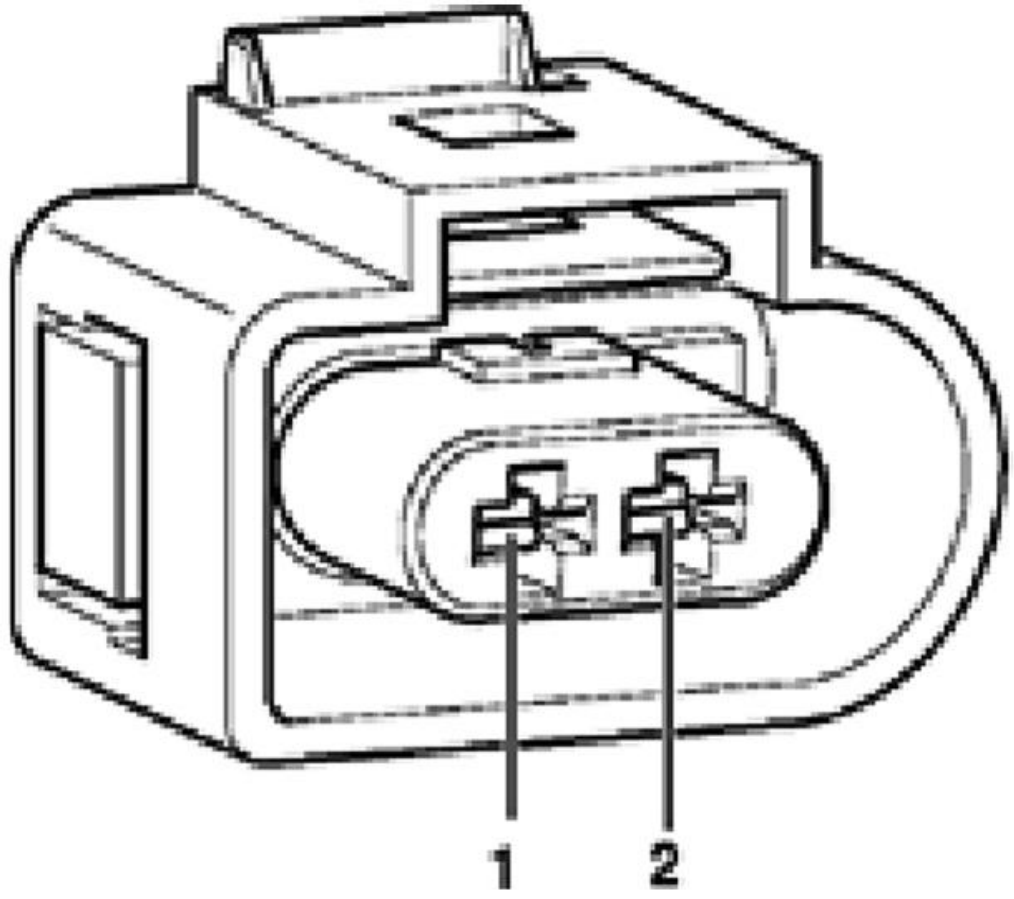


Fig. 23: Measuring Resistance Between Terminals 1 And 2 (Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If specified value is not obtained:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-, see item 12 .
  - Knock Sensor (KS) 2 -G66-, see item 13 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

Continuation for all vehicles

If specified value is obtained:

- Check wires, see **CHECKING WIRING** .

Checking wiring

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .

Vehicles with engine code APH

- Check wiring between test box and 3 -pin connector for open circuit according to wiring diagram.

  Terminal 1 + socket

  106 (Knock Sensor (KS) 1 -G61-)

  107 (Knock Sensor (KS) 2 -G66-)

  Terminal 2 + socket

  99 (Knock Sensor (KS) 1 -G61-)

  99 (Knock Sensor (KS) 2 -G66-)

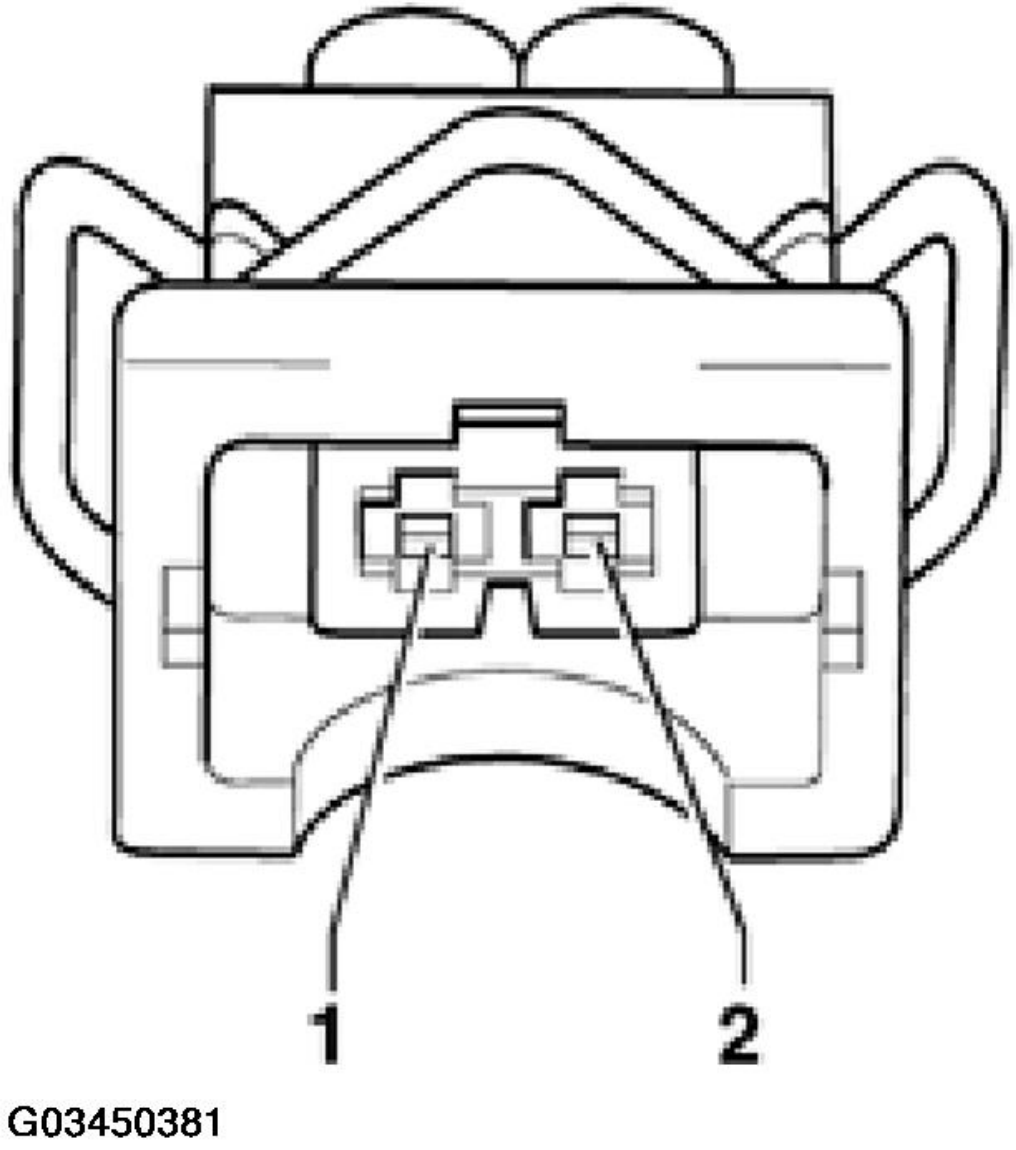


Fig. 24: Identifying Knock Sensor Harness Connector Terminals (Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Wire resistance: max. 1.5 ohm
- Also check wires for short circuit to each other.

  Specified value:INFINITY ohm

If specified value is not obtained:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-, see item 12 .
  - Knock Sensor (KS) 2 -G66-, see item 17 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

Vehicles with engine code AWP, AWV

- Check wires between test box and 2-pin connector for open circuit according to wiring diagram.

  Terminal 1 + socket

  106 (Knock Sensor (KS) 1 -G61-)

  107 (Knock Sensor (KS) 2 -G66-)

  Terminal 2 + socket

  99 (Knock Sensor (KS) 1 -G61-)

  99 (Knock Sensor (KS) 2 -G66-)

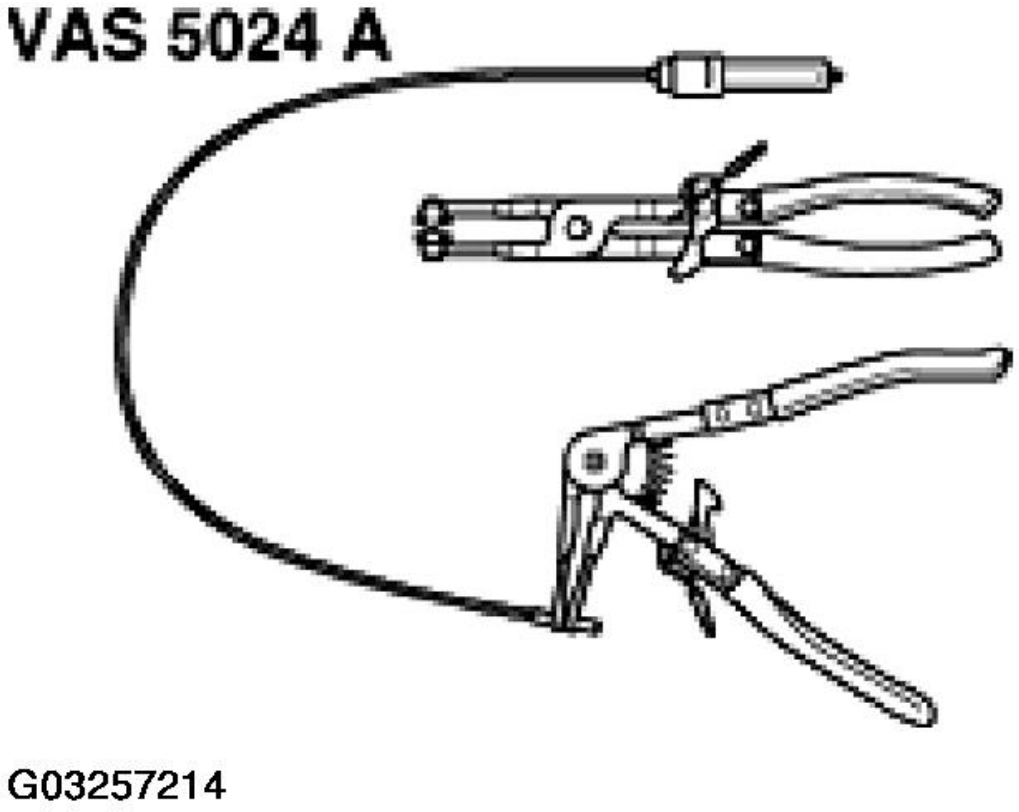


Fig. 25: Identifying Knock Sensor 2-Pin Harness Connector Terminals (Engine Code AWP, AWV) Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Wire resistance: max. 1.5 ohm
- Also check wires for short circuit to each other.

  Specified value: ohm

If specified value is not obtained:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-, see item 12 .
  - Knock Sensor (KS) 2 -G66-, see item 13 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

Valve for camshaft adjustment, checking (Vehicles with engine code AWP, AWV)

Function

The camshaft adjustment is load - and RPM dependent. The electrical valve for camshaft adjustment switches oil pressure onto camshaft adjuster (mechanical adjustment mechanism), which adjusts the camshaft.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- The respective fuses of the Valve -1- for camshaft adjustment - N205-must be OK.
- Fuel Pump (FP) Relay -J17- must be OK. Fuse box is located behind access panel at far left end of dash.

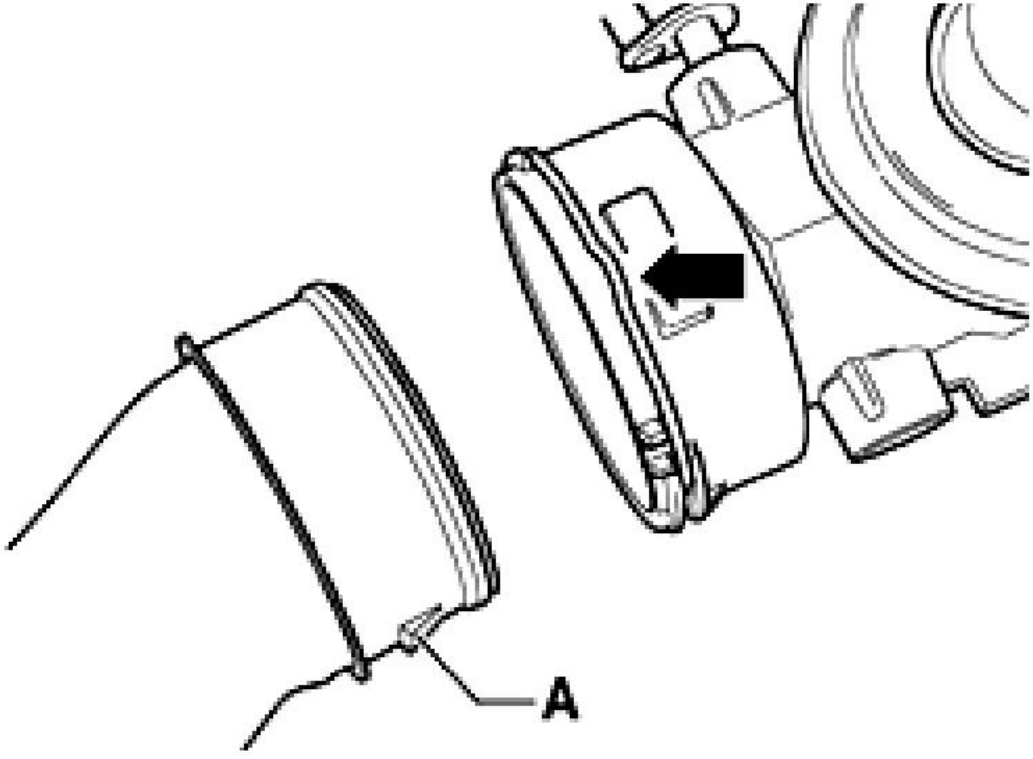


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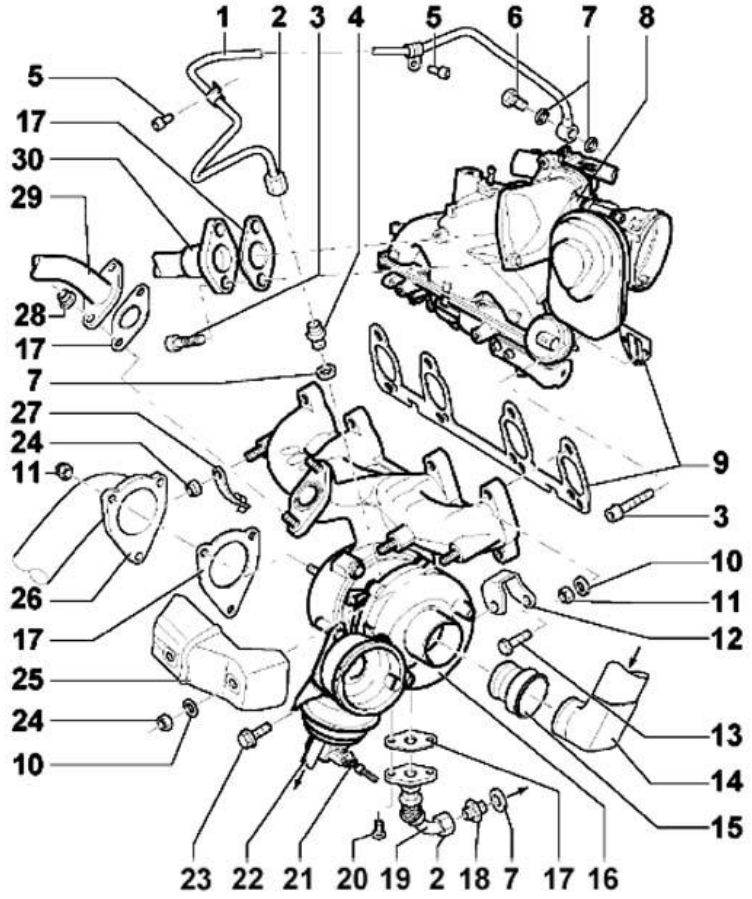
Fig. 26: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Test sequence

- Measure resistance between terminals of the respective valve for camshaft adjustment.

  Specified value: 10...18 ohm



1 - Oil supply line
2 - Union nut
3 - 22 Nm
4 - Pipe union, 30 Nm
5 - Bolt/screw
6 - Banjo bolt
7 - Seal
8 - Intake manifold
9 - Seal
10 - Washer
11 - 25 Nm
12 - Bracket
13 - 40 Nm
14 - Connecting line
15 - Transition piece
16 - Turbocharger
17 - Seal
18 - Pipe union, 40 Nm
19 - Oil return line
20 - 17 Nm
21 - Connector
22 - Vacuum hose
23 - 20 Nm
24 - 20 Nm
25 - Heat shield
26 - Front exhaust pipe
27 - Bracket
28 - 22 Nm
29 - Connecting line
30 - Connecting line

G03257216

Fig. 27: Measuring Resistance Between Terminals Of Camshaft Adjustment Valve (Engine code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If specified value is not obtained:

- Replace the valve for camshaft adjustment, see item 10 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- generate readiness code, see **READINESS CODE, GENERATING** .

If specified value is obtained:

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Check wire between test box socket 115 + 2 -pin connector terminal 2 for open circuit according to wiring diagram.

Wire resistance: max. 1.5 ohm

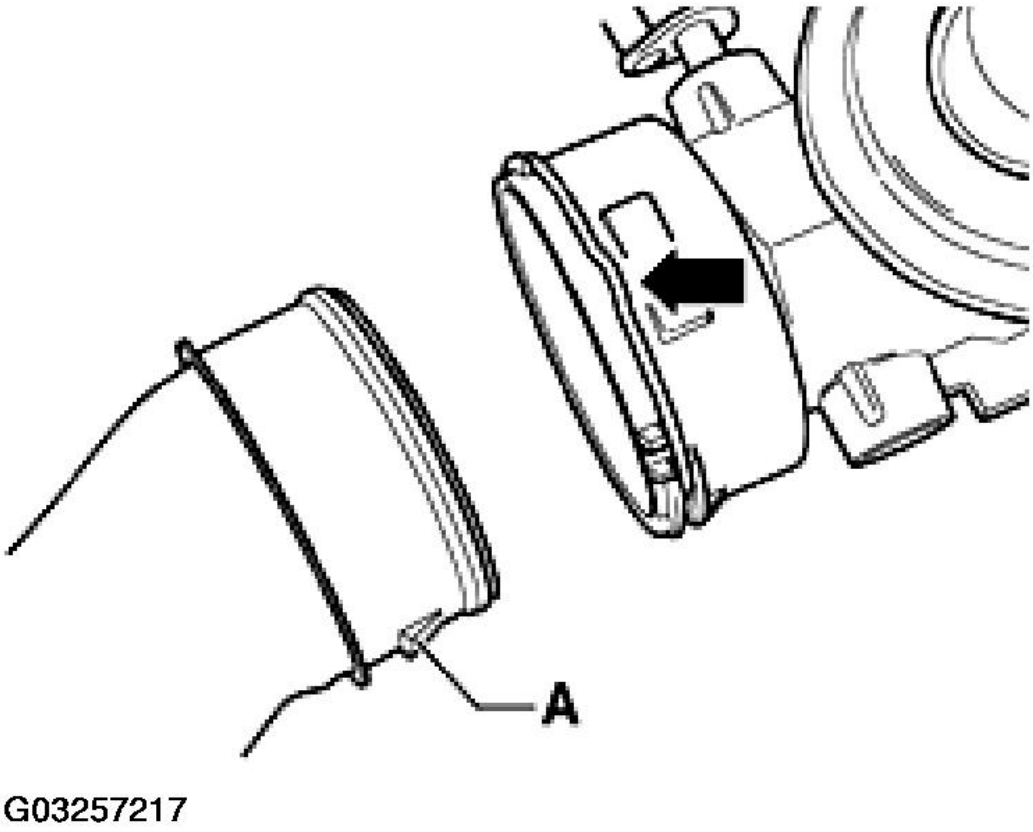


Fig. 28: Identifying Harness Connector Terminals Of Camshaft Adjustment Valve (Engine code AWP, AWV)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to B+ and Ground (GND).

  Specified value: INFINITY ohm

IGNITION/GLOW PLUG SYSTEM

IGNITION SYSTEM, SERVICING

Ignition system, general information

NOTE:

- **Only the components which specifically relate to the ignition system are dealt with here. For the other components of the injection and ignition system, see MULTIPORT FUEL INJECTION (MFI) .**
- **The engine control module is equipped with On Board Diagnostic (OBD).**
- **Components marked with * are checked via the On Board Diagnostic (OBD), see DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING .**
- **For trouble-free operation of the electrical components a voltage of at least 11.5 V is necessary.**
- **During some checks it is possible that the control module will recognize and store a DTC. Therefore, after completing all checks and repairs the DTC memory must be checked and, if necessary, erased, see DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING .**

Safety precautions, see **SAFETY PRECAUTIONS**

Test data, spark plugs, see **TEST DATA, SPARK PLUGS**

Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

- Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- The ignition must be switched off before connecting or disconnecting injection or ignition system wiring or tester cables.
- If the engine is to be turned at starter speed, without starting:

Observe following if test and measuring instruments are required during a test drive:

WARNING:

- **When driving or riding in an airbag-equipped vehicle, NEVER hold the scan tool or other test equipment in your hands or lap while in motion. Objects between you and the airbag increase the risk of injury in an accident.**

- **During a road test in an airbag-equipped vehicle, test equipment must always be fastened to and operated from the rear seat by a second technician.**

Ignition system components, removing and installing

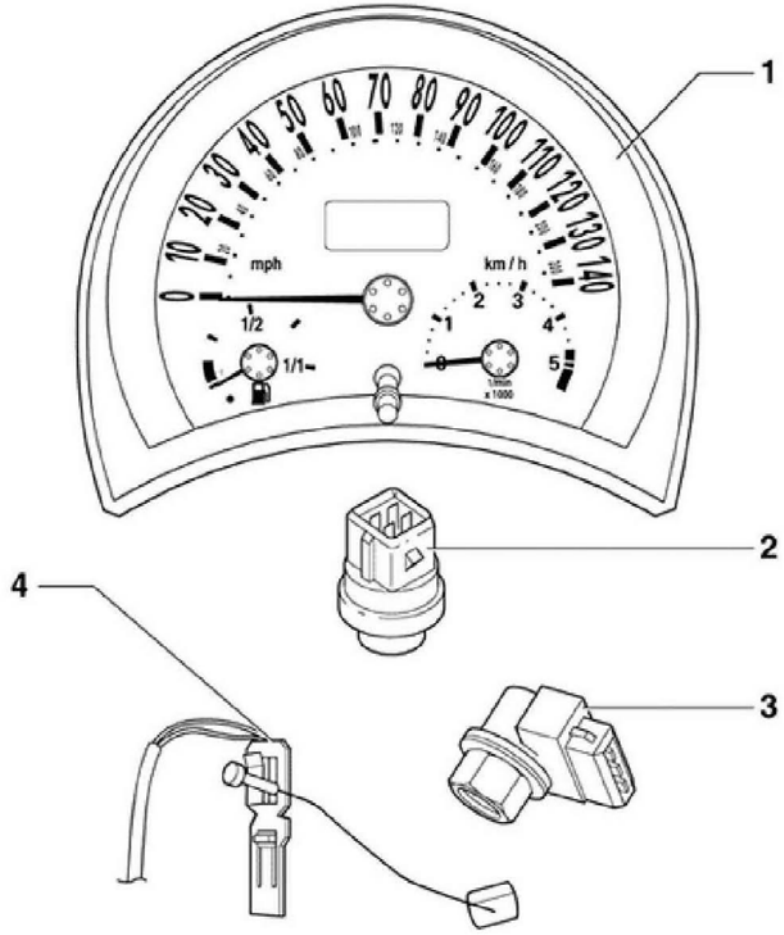
NOTE: Engine control module with connectors, see FUEL INJECTION SYSTEM COMPONENTS, REMOVING AND INSTALLING , item 6.

The following list pertains to **Fig. 1** .

1. **Connector**
   - Black, 4 pin
2. **Ignition coils with power output stages -N70-, -N127-, -N291-, -N292-**
   - Checking, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**
   - Tighten mounting bolts to 10 Nm
   - Spark plug connector can be pulled off
3. **Seal**
   - Replace if damaged
4. **Spark plug, 30 Nm**
   - Remove and install with spark plug spanner 3122B
   - Type and electrode gap, see **TEST DATA, SPARK PLUGS**
5. **Connector**
   - Black, 3-pin
   - For Camshaft Position (CMP) sensor-G40-
6. **10 Nm**
7. **Camshaft Position (CMP) sensor - G40-***
   - Location, see **COMPONENT LOCATIONS, OVERVIEW** , engine compartment overview
   - Checking, see **CAMSHAFT POSITION (CMP) SENSOR -G40-, CHECKING**
8. **25 Nm**
9. **Washer**
   - Conical
10. **Hood**
    - For Camshaft Position (CMP) sensor -G40-
    - When installing note in arrangement
11. **20 Nm**
    - Tightening torque influences the function of the knock sensor
12. **Knock sensor (KS) 1 -G61-***
    - Sensor and connector contacts are gold-plated

- Checking, see **KNOCK SENSORS, CHECKING**

13. **Connector**
    - Black, 2-pin
    - For Knock sensor (KS) 1 -G61-
    - Sensor and connector contacts are gold-plated
14. **Ground wire**
    - Only loosen or tighten with ignition switched off
15. **10 Nm**
    - Only loosen or tighten with ignition switched off
16. **Connector**
    - Black, 2-pin
    - For Knock sensor (KS) 2 -G66-
    - Sensor and connector contacts are gold-plated
17. **Knock sensor (KS) 2 -G66-***
    - Sensor and connector contacts are gold-plated
    - Checking, see **KNOCK SENSORS, CHECKING**



1 - Instrument cluster - K-

2 - Engine Coolant Temperature (ECT) sensor -G2-

3 - Speedometer Vehicle Speed Sensor (VSS) -G22-

4 - Sender for fuel gauge -G-

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Fig. 1: Identifying Ignition System Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Disconnect 4-pin connector -1- from power output stage for ignition coils (arrow).

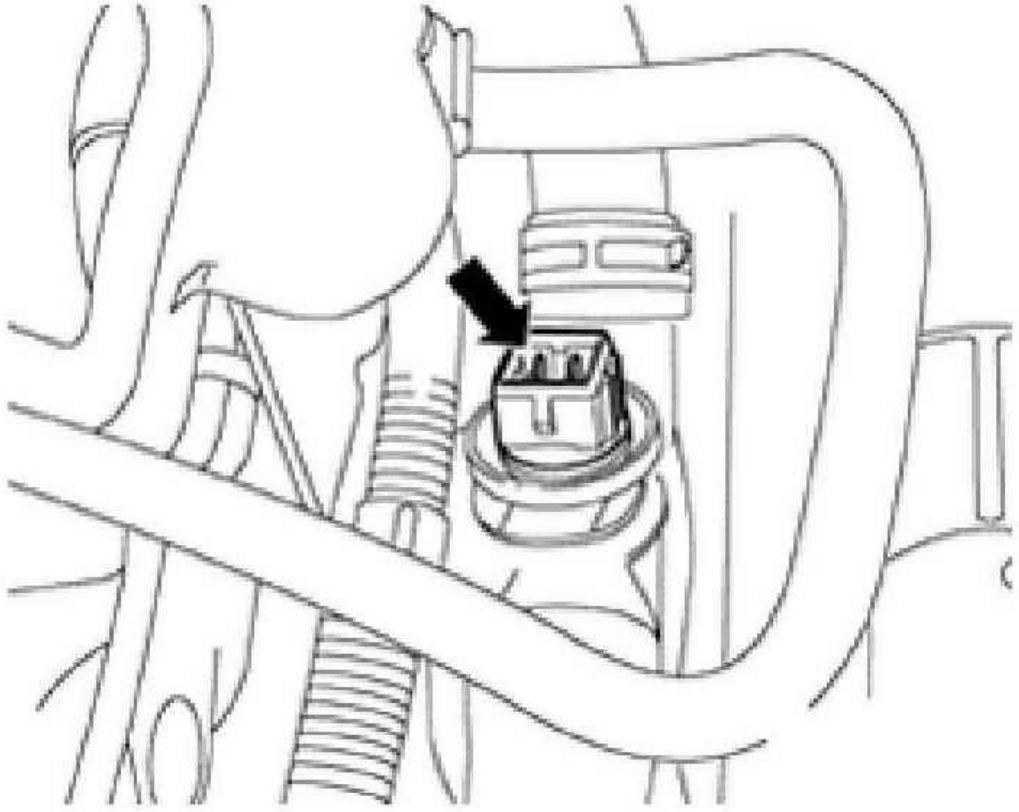
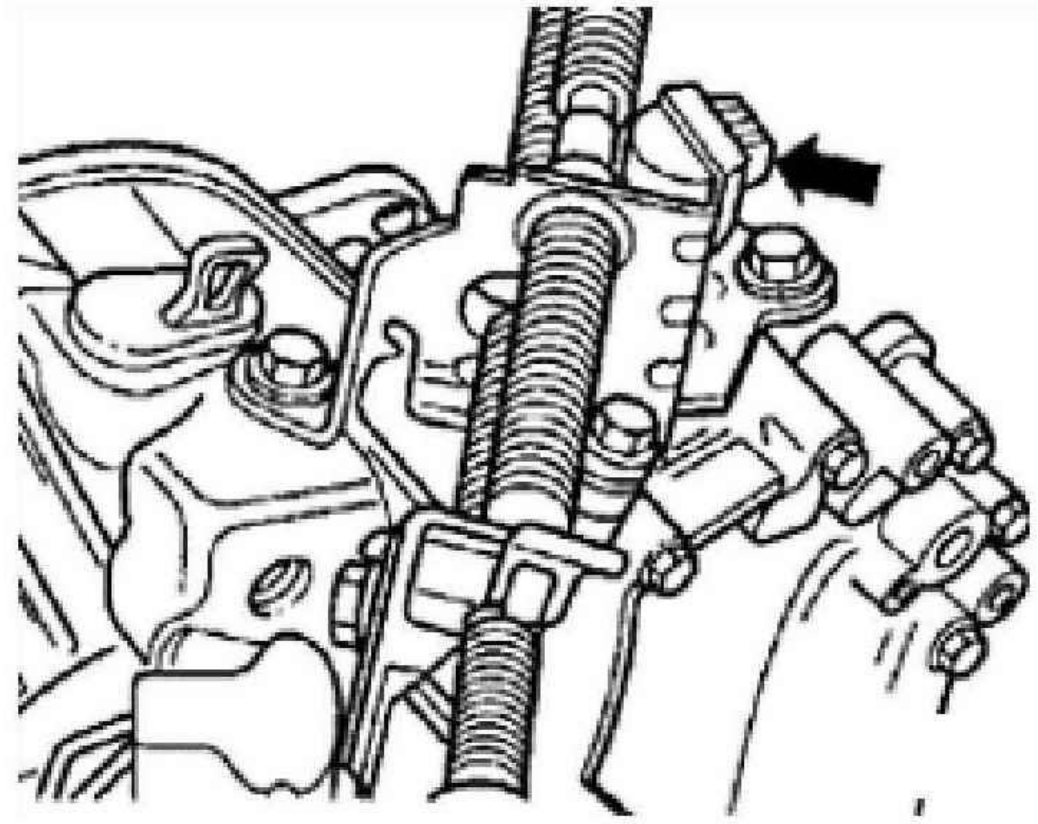


Fig. 2: Disconnecting 4-Pin Connector From Power Output Stage For Ignition Coils
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull fuse No. 32 out of fuse holder.



G03259902

Fig. 3: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Removing fuse 32 interrupts the voltage supply to the injectors. Fuse holder is located behind access panel at far left end of dash.

Test data, spark plugs

ENGINE CODE

Engine code	**APH**
Firing order	1-3-4-2
Spark plugs(1)	
VW	101 000 063 AA
Manufacturer ID	NGK PFR 6 Q
Electrode gap	max. 0.8 mm

Tightening torque	30 Nm
(1) Remove and install spark plugs with 3122B.	

Camshaft Position (CMP) sensor -G40-, checking

Special tools, test equipment and auxiliary items

- Test box V.A.G 1598/31
- Multimeter Fluke 83 (or equivalent)
- Adapter set V.A.G 1594
- Wiring diagram

Check conditions

- Camshaft Position (CMP) sensor attached tightly
- Battery voltage must be at least 11.5 V

Test sequence

- Disconnect 3-pin connector from Camshaft Position (CMP) sensor -G40- -arrow-.

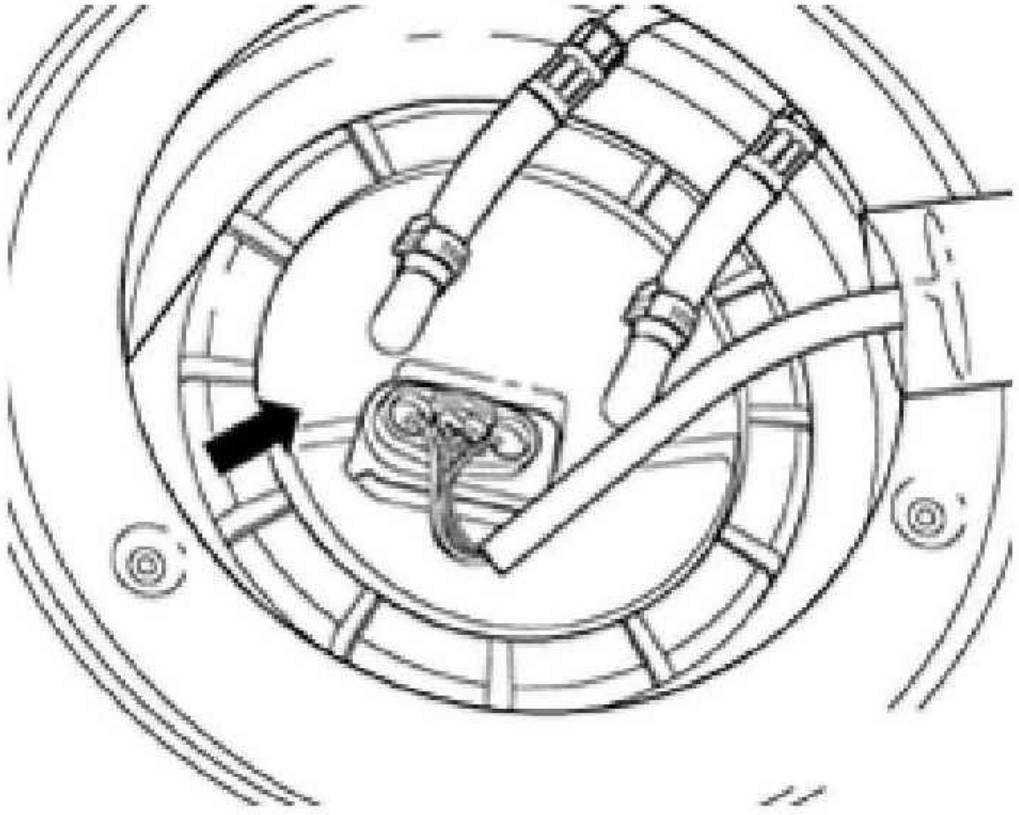


Fig. 4: Disconnecting 3-Pin Connector From Camshaft Position (CMP) Sensor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect multimeter to measure voltage with adapter cables from V.A.G 1594 to contacts 1 (positive) and 3 (Ground) on Camshaft Position (CMP) sensor connector.

Fig. 5: Measuring Voltage Between CMP Sensor Harness Connector Terminals 1 And 3
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch on ignition.

  Specification: min. 4.5 V

- Switch off ignition.

  If no voltage is present:

- Remove inner plenum chamber cover, left:

See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING**

- Connect test box V.A.G 1598/31 to control module wiring harness. Engine control module is not connected by this action.

Fig. 6: Connecting Test Box V.A.G 1598/31
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring for open circuit between test box and connector using wiring diagram.

Fig. 7: Identifying CMP Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Contact 1 + socket 98
- Contact 2 + socket 86
- Contact 3 + socket 108

Wire resistance: Max. 1.5 ohm

- Additionally check wires for short to one another.

Specification: INFINITY ohm

If no malfunctions in wiring are detected and voltage was present between contacts 1 + 3:

- Replace Camshaft Position (CMP) sensor -G40-, see item 7 .

- Check DTC memory, if necessary, repair any malfunctions and then erase DTC memory, see **DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or engine control module was disconnected from permanent positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

If no malfunction in wiring is detected and no voltage was present between contacts 1 + 3:

- Replace engine control module, see **ENGINE CONTROL MODULE (ECM), REPLACING** .

Ignition coils with power output stage, checking

Special tools, test equipment and auxiliary items

- Test box V.A.G 1598/31
- Multimeter Fluke 83 (or equivalent)
- Diode test lamp V.A.G 1527
- Adapter set V.A.G 1594
- Wiring diagram

Check conditions

- Fuse 29 must be OK

NOTE: Fuse holder is located behind access panel at far left end of dash.

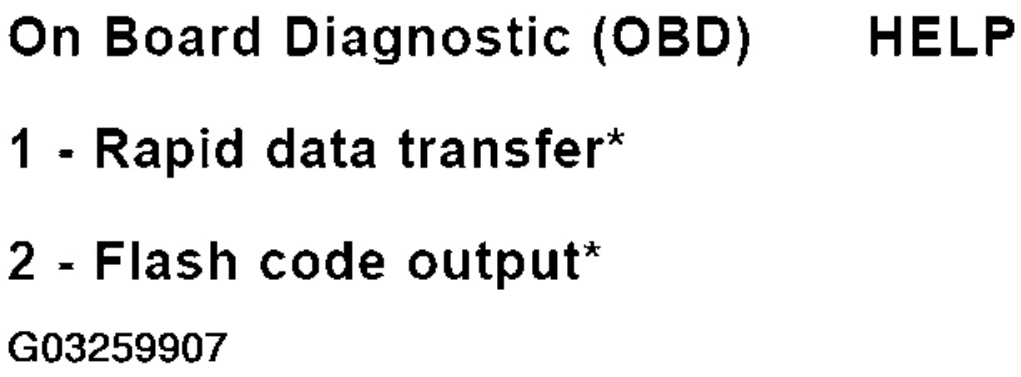


Fig. 8: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 V
- Camshaft Position (CMP) sensor must be OK, checking, see **CAMSHAFT POSITION (CMP) SENSOR -G40-, CHECKING**
- Engine speed sensor must be OK, checking, see **ENGINE SPEED (RPM) SENSOR -G28-, CHECKING**

Test sequence

NOTE: Ignition coils and final power output stages are one component and cannot be replaced individually.

- Disconnect 4-pin connector -1- off power output stage for ignition coils (arrow).

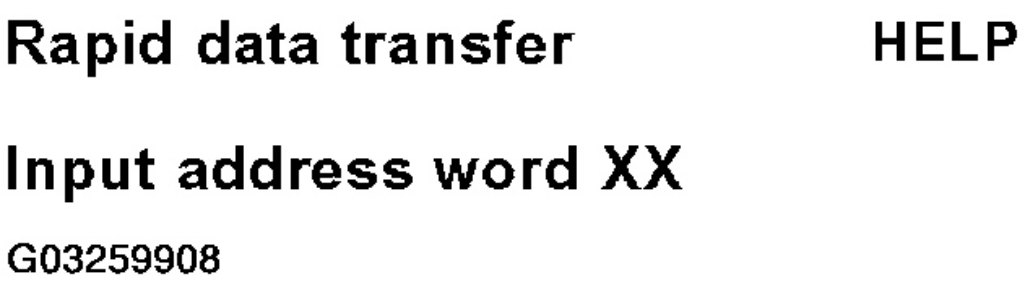


Fig. 9: Disconnecting Ignition Coil Power Output Stage 4-Pin Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking voltage supply

- Using multimeter and adapter cables from V.A.G 1594 measure supply voltage between contacts 1 + 2 and 1 + 4 of disconnected connector.
- Switch on ignition.

  Specification: Min. 11.5 V

- Switch off ignition.

Fig. 10: Identifying Ignition Coil Power Output Stage 4-Pin Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If no voltage is present:

- Check wire between 4 -pin connector contact 2 and relay plate for open circuit according to wiring diagram.

  Wire resistance: max. 1.5 ohm

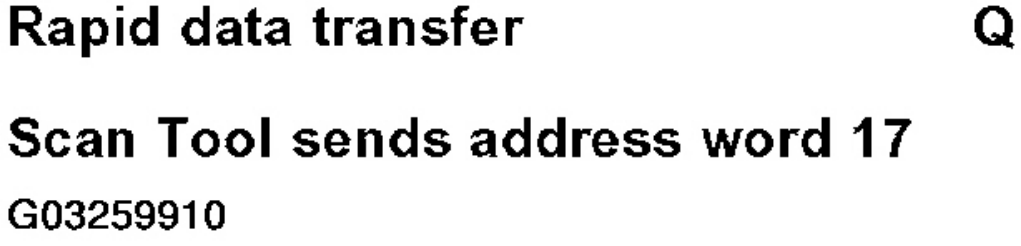


Fig. 11: Identifying Ignition Coil Power Output Stage 4-Pin Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between 4 -pin connector and Ground (GND) for open circuit according to wiring diagram.
  - Terminal 2 and Ground (GND)
  - Terminal 4 and Ground (GND)

  Wire resistance: max. 1.5 ohm

If there is no malfunction in the supply voltage:

- Check activation, see **CHECKING ACTIVATION** .

Checking activation

WARNING: During the following test do not touch the connecting parts of the ignition coils or test cables.

- Pull fuse No. 32 out of fuse holder.

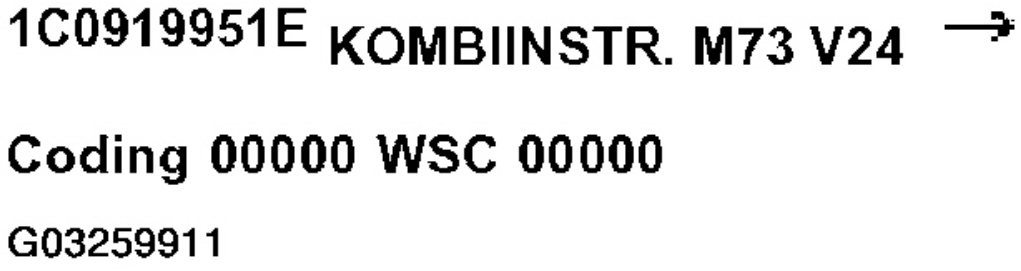


Fig. 12: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Removing fuse 32 interrupts the voltage supply to the injectors. Fuse holder is located behind access panel at far left end of dash.

- Connect diode test lamp V.A.G 1527 with adapter cables from V.A.G 1594 to contacts of disconnected connector

  Contacts 2 + 3

Fig. 13: Identifying Ignition Coil Power Output Stage 4-Pin Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate starter and check ignition signal from engine control module.

  LED must flicker

- Switch off ignition.

When the LED flickers and the supply voltage is OK:

- Replace relevant ignition coil with power output stage, see item 2 .
- Check DTC memory, if necessary, repair any malfunctions and then erase DTC memory, see **DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or engine control module was disconnected from permanent positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

  If LED does not flicker:

- Check wiring, see **CHECKING WIRING** .

Checking wiring

- Remove inner plenum chamber cover, left:

  See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING**

- Connect test box V.A.G 1598/31 to control module wiring harness. Engine control module is not connected by this action.

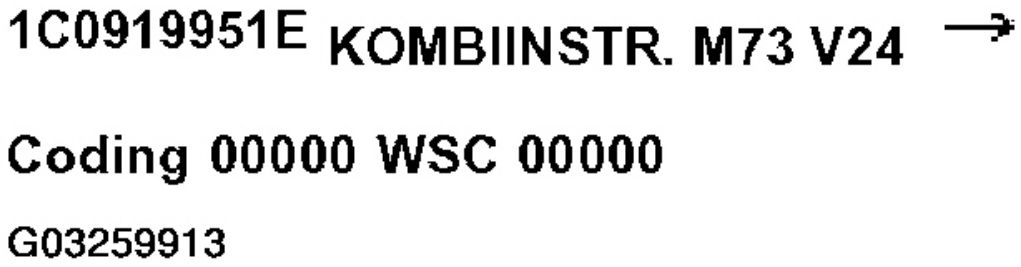


Fig. 14: Connecting Test Box V.A.G 1598/31

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between test box and 4 -pin connector for open circuit according to wiring diagram.
  - Cylinder 1 contact 3 + socket 102
  - Cylinder 2 contact 3 + socket 95
  - Cylinder 3 contact 3 + socket 103
  - Cylinder 4 contact 3 + socket 94

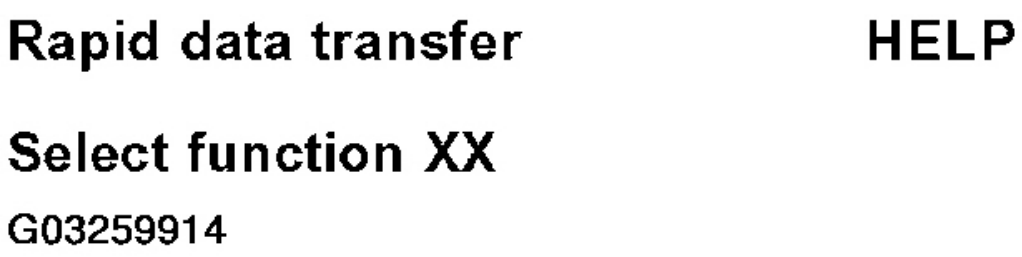


Fig. 15: Identifying Ignition Coil Power Output Stage 4-Pin Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Wire resistance: Max. 1.5 ohm

- Additionally check wires for short to one another.

  Specification: INFINITY ohm

  If no malfunction can be found in the wiring:

- Replace Engine Control Module (ECM), see **ENGINE CONTROL MODULE (ECM), REPLACING** .

Knock sensors, checking

NOTE:

- **It is extremely important to keep to the tightening torque of 20 Nm to ensure the knock sensors perform perfectly.**

- Only gold-plated contacts may be used when servicing the knock sensor connector contacts.

Special tools, test equipment and auxiliary items

- Scan tool V.A.G 1551 or vehicle system tester V.A.G 1552 with cable V.A.G 1551/3B
- Test box V.A.G 1598/31

- Multimeter Fluke 83 (or equivalent)
- Adapter set V.A.G 1594
- Wiring diagram

Check conditions

- On Board Diagnostic (OBD) must have recognized a malfunction in one or both knock sensors, see **DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING**
- Coolant temperature must be at least 85 °C, see display group 28, display zone 3

Checking function

- Connect scan tool V.A.G 1551 ((V.A.G 1552). Start engine and select "Address word" 01 of engine control module. Engine must be running at idle speed. Connecting scan tool and selecting engine control module, see **V.A.G 1551 SCAN TOOL, CONNECTING AND SELECTING ENGINE CONTROL MODULE** .

Indicated on display

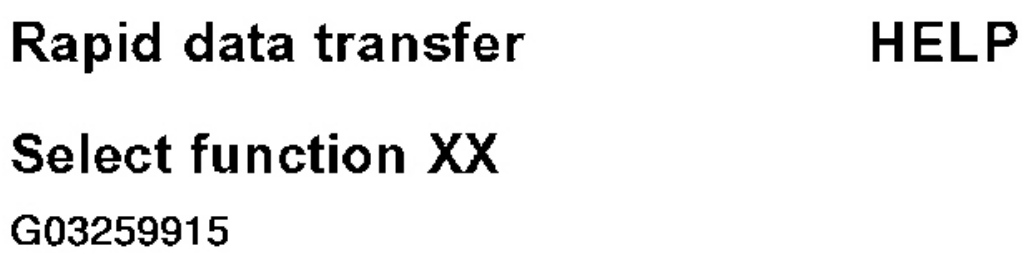


Fig. 16: VAG 1551 Scan Tool Display - Checking Knock Sensor (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press keys 0 and 8 for function "Read measured value block" and confirm entry with Q key.

Indicated on display

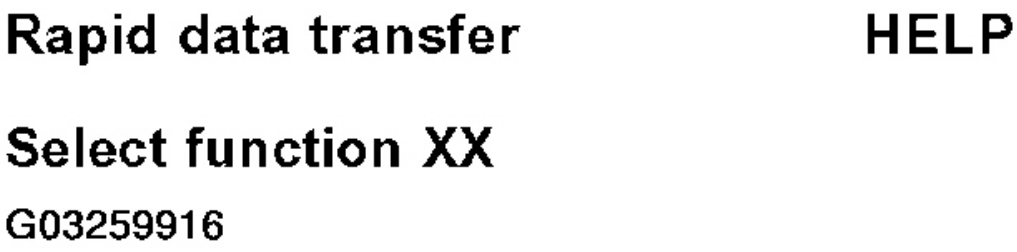


Fig. 17: VAG 1551 Scan Tool Display - Checking Knock Sensor (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press keys 0, 2 and 8 for "Display group number 28" and confirm entry with Q key.

Indicated on display (1-4 Display zones)

Fig. 18: VAG 1551 Scan Tool Display - Checking Knock Sensor (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Checking the knock sensors must be performed during a test drive because the knock sensors OBD is not activated until the engine speed exceeds 2000 RPM and the engine is loaded by more than 40 %.

- Perform a test drive and check knock control specifications on display (display zone 4).

Observe the valid safety precautions when performing a test drive, see **SAFETY PRECAUTIONS** .

DISPLAY GROUP 28: IGNITION, KNOCK CONTROL

	Display zones			
	1	**2**	**3**	**4**
Display group 28: ignition, knock control				
Display	xxxx RPM	xxx.x %	xxx.x °C	Test OFF/Test ON Syst. OK. Syst. n. OK.
Indicated	Engine speed (in steps of 40)	Engine load	Coolant temperature	OBD condition and OBD result
Working range	0-6800 RPM	0.0 - 100.0 %	-45.0 -143.0 °C	-
Specification	at least 2000 RPM	> 40.0 %	85.0 -105.0 °C	Syst. OK.
	-	-	-	If the specifications are not achieved, see **CONTINUATION:**

If the specification is attained:

- Press --> key.
- Press keys 0 and 6 for function "End output" and confirm entry with Q key.
- Switch off ignition.

Continuation:

If the specifications are not obtained:

- Press --> key.
- Press keys 0 and 6 for function "End output" and confirm entry with Q key.
- Switch off ignition.
- Separate 2-pin connector to Knock sensor 1 -G61- -1- and/or 2 - pin connector to Knock sensor 2 -G66- -2-.

Fig. 19: Separating 2-Pin Connector To Knock Sensors
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between contacts 1 + 2 at connections to knock sensors.

Specification INFINITY ohm

Fig. 20: Measuring Resistance Between Contacts 1 And 2 At Knock Sensor Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If the specification is not obtained:

- Replace Knock sensor/s -G61- or -G66-, see item 12 or item 17 .
- Check DTC memory, if necessary, repair any malfunctions and then erase DTC memory, see **DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING** .
- Read-out readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or engine control module was disconnected from permanent positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

If the specification is obtained:

- Check wiring, see **CHECKING WIRING** .

Checking wiring

- Remove inner plenum chamber cover, left:

  See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING** .

- Connect test box V.A.G 1598/31 to control module wiring harness. Engine control module is not connected by this action.

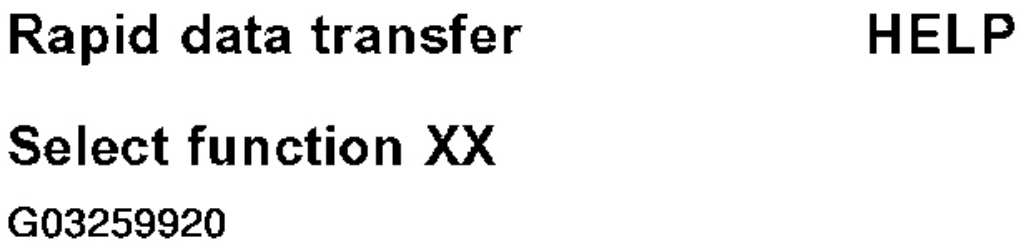


Fig. 21: Connecting Test Box V.A.G 1598/31 To Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between test box and 2 -pin connector for open circuit using wiring diagram.

  -G61- -G66-

  Contact 1 + socket 106 107

  Contact 2 + socket 99 99

  Wire resistance: Max. 1.5 ohm

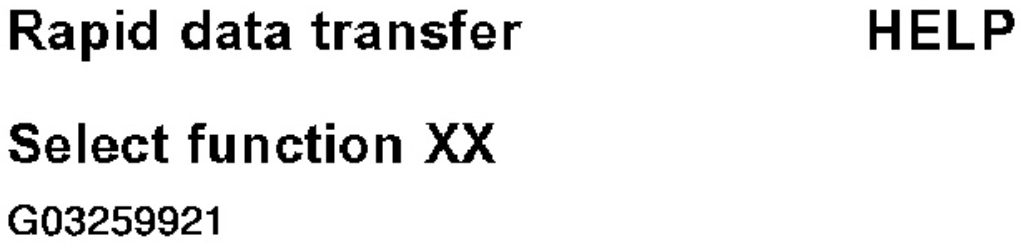


Fig. 22: Identifying Knock Sensor 2-Pin Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Additionally check wires at socket 99 for short to sockets 106 and 107.

Specification: INFINITY ohm

If no malfunctions in wiring are detected:

- Loosen knock sensor and tighten again to 20 Nm.
- Perform a test drive again and check knock control specifications on display.

During the road test coolant temperature must exceed 85 °C

When the temperature is reached, the operating conditions must be attained several times:

- Idle
- Part throttle
- Wide open throttle
- Overrun

- At Wide open throttle the speed must exceed 3500 RPM.

- Again check control module DTC memory.

If the malfunction is still present:

- Replace Knock sensor/s -G61- or -G66-, see item 12 or item 17 .
- Check DTC memory, if necessary, repair any malfunctions and then erase DTC memory, see **DIAGNOSTIC TROUBLE CODE (DTC) MEMORY, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or engine control module was disconnected from permanent positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

Misfiring recognition, checking

Special tools, test equipment and auxiliary items

- Scan tool V.A.G 1551 or vehicle system tester V.A.G 1552 with cable V.A.G 1551/3B

Test sequence

- Connect scan tool V.A.G 1551 ((V.A.G 1552). Start engine and select "Address word" 01 of engine control module. engine must be running at idle speed. (Connecting scan tool and selecting engine control module, see **V.A.G 1551 SCAN TOOL, CONNECTING AND SELECTING ENGINE CONTROL MODULE**).

Indicated on display

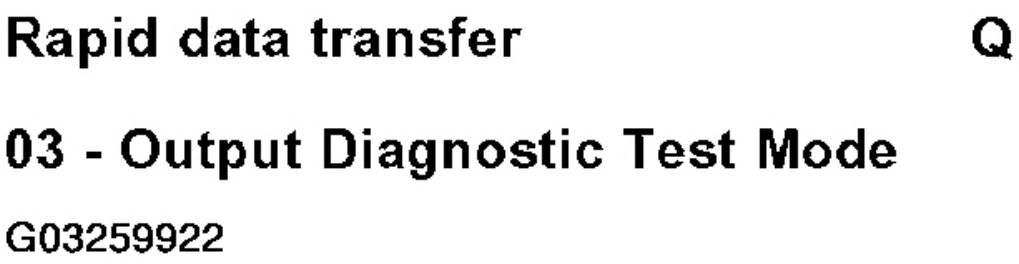


Fig. 23: VAG 1551 Scan Tool Display - Checking Misfiring Recognition (1 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press keys 0 and 8 for function "Read measured value block" and confirm entry with Q key.

Indicated on display

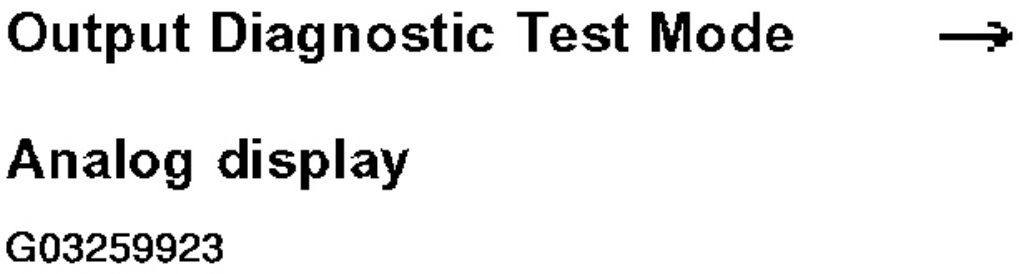


Fig. 24: VAG 1551 Scan Tool Display - Checking Misfiring Recognition (2 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press keys 0, 1 and 4 for "Display group number 14" and confirm entry with Q key.

Indicated on display (1-4 Display zones)

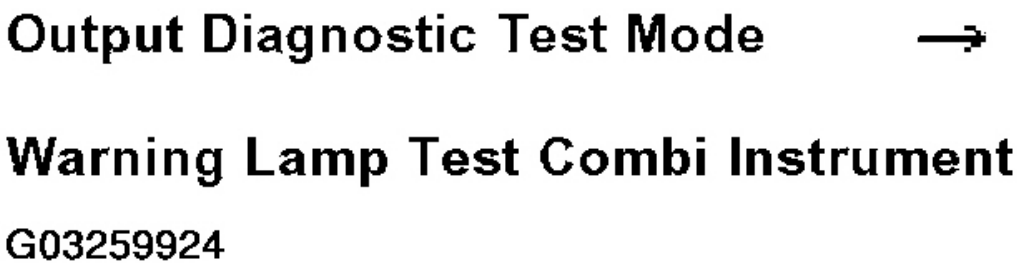


Fig. 25: VAG 1551 Scan Tool Display - Checking Misfiring Recognition (3 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Increase engine speed until display field 4 indicates status -Misfire recognition activated -.
- Check total number of misfires in display zone 3.

DISPLAY GROUP 14: IGNITION, MISFIRE RECOGNITION

	Display zones			
	1	**2**	**3**	**4**
Display group 14: ignition, misfire recognition				
Display	xxxx RPM	xxx.x %	xxx	Activated Blocked
Indicated	Engine speed (in 40 steps)	Engine load	Catalyst damaging misfires (Total)	Misfire recognition status
Working range	0-6800 RPM	0.0 -100.0 %	0-65000	-
Specification	-	>14.0 %	0	activated

If the specification is not obtained, see **EVALUATING DISPLAY GROUP 14, DISPLAY ZONE 3 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES** , Evaluating display group 14

If the specifications are obtained:

- Press key.
- Press keys 0 and 6 for "End output" function and confirm input with Q key.
- Switch off ignition.

If the specifications are not attained:

- Change to display group 15 as follows:
- Press key 3 ((V.A.G 1551) or key UPARROW (V.A.G 1552).

Indicated on display (1-4 Display zones)

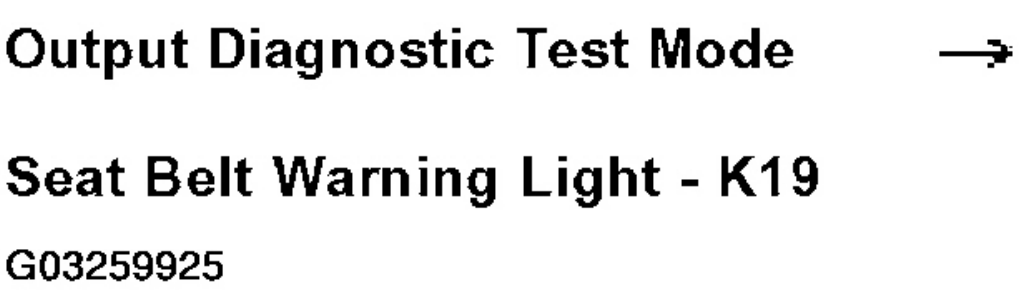


Fig. 26: VAG 1551 Scan Tool Display - Checking Misfiring Recognition (4 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Increase engine speed until display field 4 indicates status - Misfire recognition activated -.
- Check misfiring in display zones 1 -3.

DISPLAY GROUP 15: IGNITION, MISFIRE RECOGNITION

	Display zones			
	1	**2**	**3**	**4**
Display group 15: ignition, misfire recognition				
Display	xxx	xxx	xxx	Activated Blocked
Indicated	Catalyst damaging misfires Cyl. 1	Catalyst damaging misfires Cyl. 2	Catalyst damaging misfires Cyl. 3	Misfire recognition status
Working range	0-65000	0-65000	0-65000	-
Specification	0	0	0	activated

If the specification is not obtained, see **EVALUATING DISPLAY GROUP 14, DISPLAY ZONE 3 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES** , Evaluating display groups 15 and 16

If the specifications are obtained:

- Change to display group 16 as follows:
- Press key 3 ((V.A.G 1551) or key UPARROW (V.A.G 1552).

Indicated on display (1 and 4 Display zones)

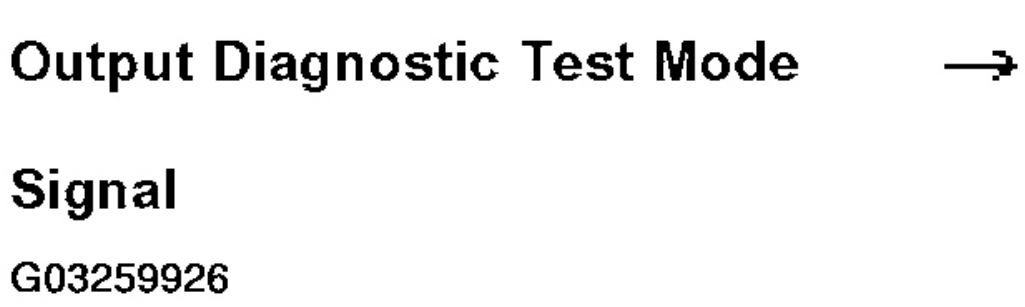


Fig. 27: VAG 1551 Scan Tool Display - Checking Misfiring Recognition (5 Of 5)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Increase engine speed until display field 4 indicates status -Misfire recognition activated -.
- Check misfiring in display zone 1.

DISPLAY GROUP 16: MISFIRING RECOGNITION

	Display zones			
	1	2	3	4
Display group 16: misfiring recognition				
Display	xxx	-	-	Active Blocked
Indicated	Exhaust damaging misfires Cyl. 4	-	-	Misfire status recognition
Working range	0-65000	-	-	-
Specification	0	-	-	activated

If the specification is not obtained, see **EVALUATING DISPLAY GROUP 14, DISPLAY ZONE 3 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES** , Evaluating display groups 15 and 16

- Press --> key.
- Press keys 0 and 6 for "End output" function and confirm input with Q key.
- Switch off ignition.

Evaluating display group 14, display zone 3 - total number of catalyst damaging misfires

EVALUATING DISPLAY GROUP 14, DISPLAY ZONE 3 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES

Appears on display	Possible malfunction cause	Malfunction elimination
Larger 0	• Spark plug malfunctioning • Ignition coil	• Check spark plugs, see **IGNITION SYSTEM, SERVICING**

	malfunctioning • Power output stage for ignition coil malfunctioning	• Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**
	• Injector malfunctioning	• Check injectors, see **FUEL INJECTORS, CHECKING**

Evaluating display group 15 display zones 1 to 4/display group 16 display zones 1 and 4 - catalyst damaging misfires Cyl. 1 to Cyl. 4

EVALUATING DISPLAY GROUP 15 DISPLAY ZONES 1 TO 4/DISPLAY GROUP 16 DISPLAY ZONES 1 AND 4 - CATALYST DAMAGING MISFIRES CYL. 1 TO CYL. 4

Appears on display	Possible malfunction cause	Malfunction elimination
Larger 0	• Spark plug malfunctioning • Ignition coil malfunctioning • Power output stage for ignition coil malfunctioning	• Check spark plugs, see **IGNITION SYSTEM, SERVICING** • Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**
	• Injector malfunctioning	• Check injectors, see **FUEL INJECTORS, CHECKING**

IGNITION/GLOW PLUG SYSTEM

IGNITION SYSTEM, SERVICING

General notes on ignition system

NOTE:

- **Only the components which specifically relate to the ignition system are dealt with here. For the other components of the fuel injection system, see MULTIPORT FUEL INJECTION (MFI) .**
- **The Engine Control Module is equipped with On Board Diagnostic (OBD).**
- **Components marked with * are checked via the On Board Diagnostic (OBD), see DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING .**
- **For trouble -free operation of the electrical components a voltage of at least 11.5 V is necessary.**
- **During some checks it is possible that the control module will recognize and store a DTC. Therefore after completing all checks and repairs the DTC memory must be checked and if necessary erased, see DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING .**

Safety precautions, see **SAFETY PRECAUTIONS**

Test data, spark plugs, see **TEST DATA, SPARK PLUGS**

Ignition system components, removing and installing

NOTE:

- **Engine Control Module with connectors, see FUEL INJECTION SYSTEM COMPONENTS, REMOVING AND INSTALLING , item 6.**
- **Components marked with * are checked via the On Board Diagnostic (OBD), see DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING .**

The following list pertains to **Fig. 1** .

1. **Connector**
   - Black, 4 pin
2. **Ignition coils with power output stages (-N70-, -N127-, -N291-, -N292-)**
   - Checking, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**

- For removing use only removal tool T40039, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**

3. **Circlip**
   - For ignition coil with power output stage (-N70-, -N127-, -N291-, -N292-)
   - Replace if damaged
4. **Spark plug, 30 Nm**
   - Remove and install with spark plug wrench 3122B
   - Type and electrode gap, see **TEST DATA, SPARK PLUGS**
5. **Connector**
   - Black, 3-pin
   - For Camshaft Position (CMP) sensor -G40-
   - Sensor and connector terminals are gold-plated
6. **Bolt, 10 Nm**
7. **Camshaft Position (CMP) sensor - G40-***
   - Component location, see **COMPONENT LOCATIONS, OVERVIEW** , engine compartment overview
   - Checking, see **CAMSHAFT POSITION (CMP) SENSOR -G40-, CHECKING**
8. **Bolt, 25 Nm**
9. **Washer**
   - Conical
10. **Hood**
    - For Camshaft Position (CMP) sensor -G40-
    - When installing note fixing arrangement
11. **Bolt, 20 Nm**
    - Tightening torque influences the function of the Knock Sensor (KS)
12. **Knock Sensor (KS) (KS) 1 -G61-***
    - Sensor and connector terminals are gold-plated
    - Component location: Cylinder block intake side
    - Checking, see **KNOCK SENSORS (KS), CHECKING**
13. **Knock Sensor (KS) 2 -G66-***
    - Sensor and connector terminals are gold-plated
    - Component location: Cylinder block intake side
    - Checking, see **KNOCK SENSORS (KS), CHECKING**
14. **Connector**
    - 2-pin
    - For Knock Sensor (KS) 1 -G61-
    - Sensor and connector terminals are gold-plated
    - Black for Knock Sensor (KS) 1 -G61-

- Black for Knock Sensor (KS) 2 -G66-
- Mark connector before removing

15. **Ground (GND) wire**
    - Only loosen or tighten with ignition switched off
16. **Bolt, 10 Nm**
    - Only loosen or tighten with ignition switched off

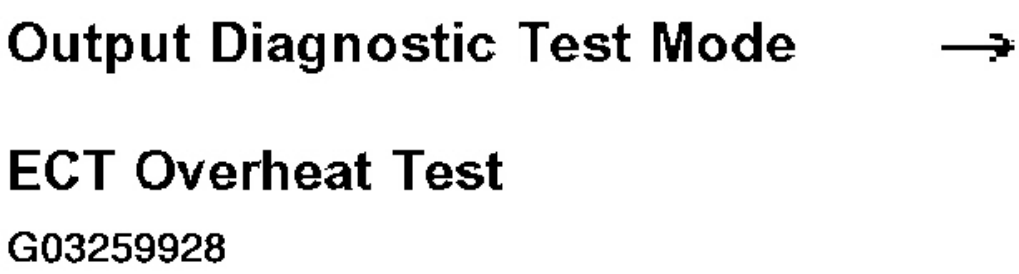


Fig. 1: Identifying Ignition System Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, the following must be noted:

WARNING: When doing any repair work, especially in the engine compartment, due to the cramped conditions, pay attention to the following:

- **Route all sorts of lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum lines and hoses) and electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

- Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- The ignition must be switched off before connecting or disconnecting injection or ignition system wiring or tester cables.
- If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, pull connector off output stage:

- Disconnect all 4 -pin connectors -2- from ignition coils with power output stage -1-.

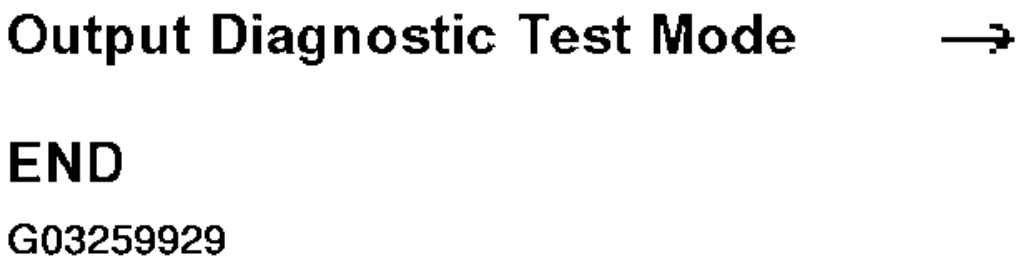


Fig. 2: Disconnecting All Pin Connectors From Ignition Coils
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Pull fuse No. 32 out of fuse holder.

NOTE: Removing fuse 32 interrupts the voltage supply to the fuel injectors. Fuse holder is located behind access panel at far left end of dash.

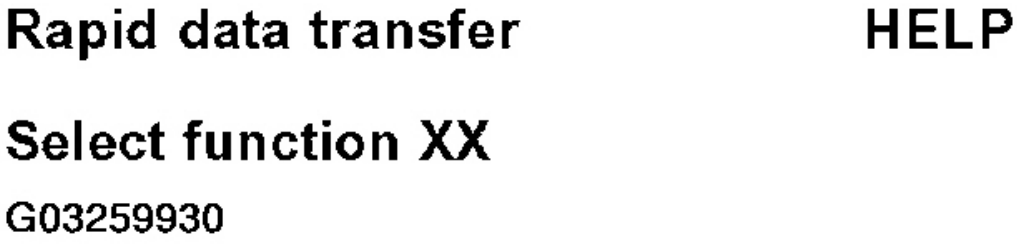


Fig. 3: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Observe following if test and measuring instruments are required during a road test:

WARNING:

- **When driving or riding in an airbag -equipped vehicle, NEVER hold the scan tool or other test equipment in your hands or lap while in motion. Objects between you and the airbag increase the risk of injury in an accident.**
- **During a road test in an airbag -equipped vehicle, test equipment**

must always be fastened to and operated from the rear seat by a second technician.

Test data, spark plugs

TEST DATA, SPARK PLUGS

Engine code	**AWP**	**AWV**
Firing order	1-3-4-2	1-3-4-2
Spark plugs(1) , (2)		
VW/Audi	101 000 063 AA	101 000 063 AA
Manufacturer ID	NGK PFR 6 Q	NGK PFR 6 Q
Electrode gap	max. 0.8 mm	max. 0.8 mm
Tightening torque	30 Nm	30 Nm
(1) The up-to -date figures and the spark plug change intervals:		
(2) Remove and install spark plugs with 3122B and appropriate extension.		

See **MAINTENANCE**

Camshaft Position (CMP) sensor -G40-, checking

Special tools, test equipment and auxiliary items

- V.A.G 1598/31 test box
- V.A.G 1526 A or Fluke 83 multimeter
- V.A.G 1594 C adapter set
- Electrical Wiring Diagrams

Test conditions

- Camshaft Position (CMP) sensor -G40- installed tightly
- Battery voltage must be at least 11.5 V

Test sequence

- Disconnect 3-pin connector from Camshaft Position (CMP) sensor -arrow-.

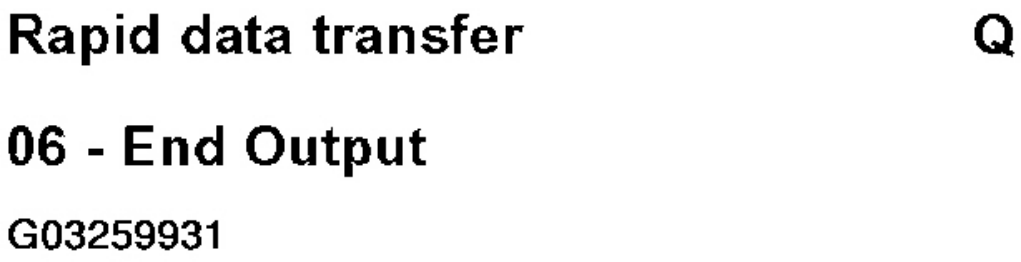


Fig. 4: Disconnecting 3-Pin Connector From Camshaft Position (CMP) Sensor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect multimeter to measure voltage with adapter cables from V.A.G 1594 C to terminals 1 (positive) and 3 (Ground) on Camshaft Position (CMP) sensor connector.

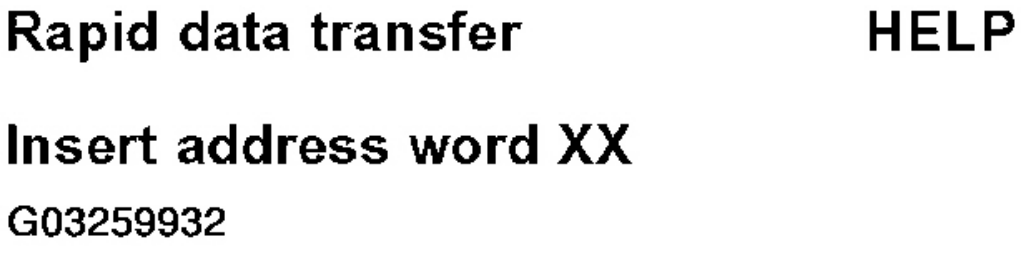


Fig. 5: Connecting Multimeter To Terminals 1 And 3 Of CMP Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch on ignition.

  Specification: min. 4.5 V

- Switch off ignition.

  If no voltage is present:

- Remove inner plenum chamber cover, left:

See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING**

- Connect V.A.G 1598/31 test box to control module wiring harness. Engine Control Module is not connected by this action.

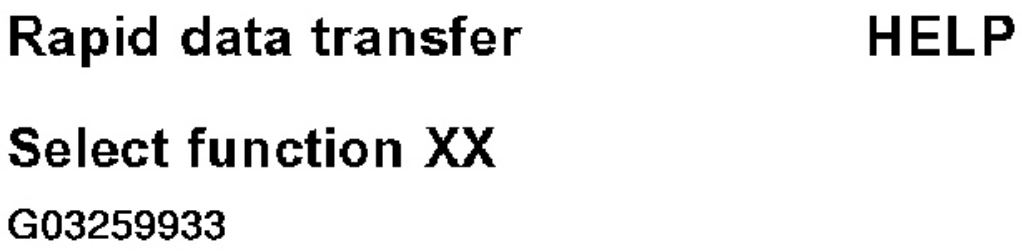


Fig. 6: Connecting V.A.G 1598/31 Test Box To Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring for open circuit between test box and connector using Electrical Wiring Diagrams.

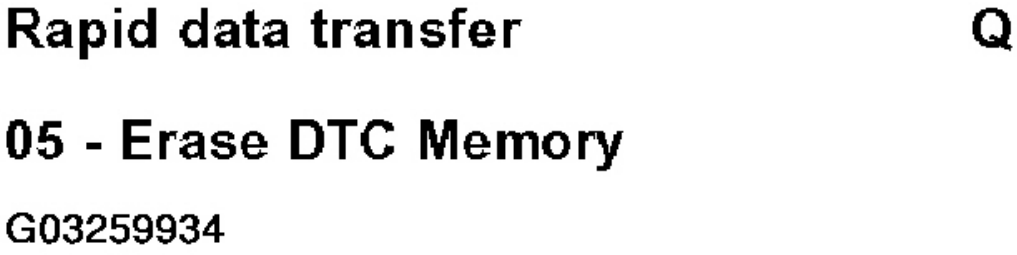


Fig. 7: Identifying CMP Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Contact 1 + socket 98
- Contact 2 + socket 86
- Contact 3 + socket 108

Wire resistance: Max. 1.5 ohm

- Additionally check wires for short to one another.

  Specification: ohm

  If no malfunctions in wiring are detected and voltage was present between terminals 1 + 3:

- Replace Camshaft Position (CMP) sensor -G40-, see item 7 .
- Check DTC Memory, if necessary, repair any malfunctions and then Erase DTC Memory, see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or Engine Control Module was disconnected from battery positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

  If no malfunction in wiring is detected and no voltage was present between terminals 1 + 3:

- Replace Engine Control Module, see **MOTRONIC ENGINE CONTROL MODULE (ECM) - J220-, REPLACING** .

Ignition coils with power output stage, checking

Special tools, test equipment and auxiliary items

- V.A.G 1598/31 test box
- V.A.G 1526 A or Fluke 83 multimeter
- V.A.G 1527 B voltage tester
- V.A.G 1594 C adapter set
- Removal tool T40039
- Electrical Wiring Diagrams

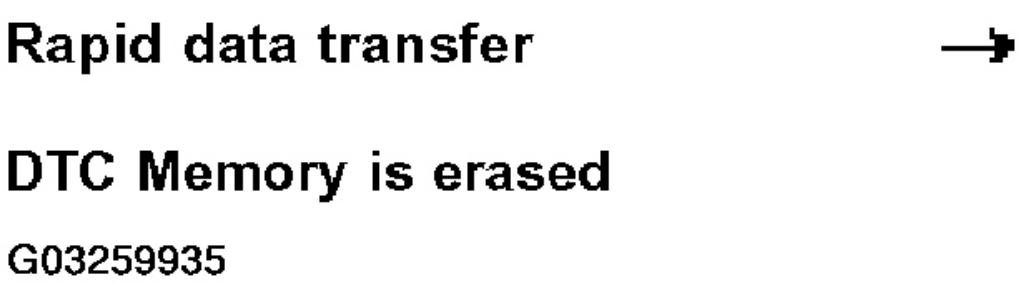


Fig. 8: Identifying Special Tools

Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test conditions

- All fuses must be OK. Fuse holder is located behind access panel at far left end of dash.

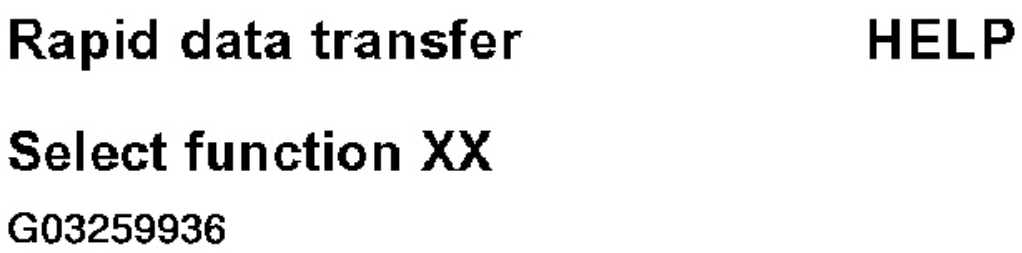


Fig. 9: Locating Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 V
- Camshaft Position (CMP) sensor -G40- must be OK, checking, see **CAMSHAFT POSITION (CMP) SENSOR -G40-, CHECKING**
- Engine speed (RPM) sensor must be OK, checking, see **ENGINE SPEED (RPM) SENSOR, CHECKING**

NOTE: Ignition coils and power output stages are one component and cannot be replaced individually.

Test sequence

- Disconnect 4-pin connector -2- from ignition coil with power output stage to be checked -1-..

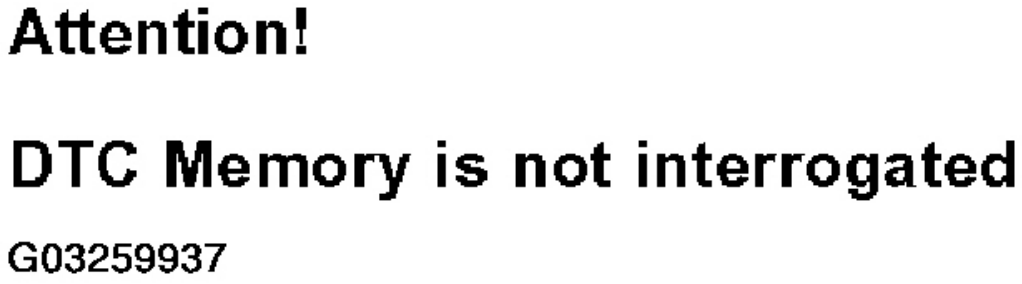


Fig. 10: Disconnecting 4-Pin Connector From Ignition Coil
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking voltage supply

- Using multimeter and adapter cables from V.A.G 1594 C measure supply voltage between terminals 1 + 2 and 1 + 4 of disconnected connector.

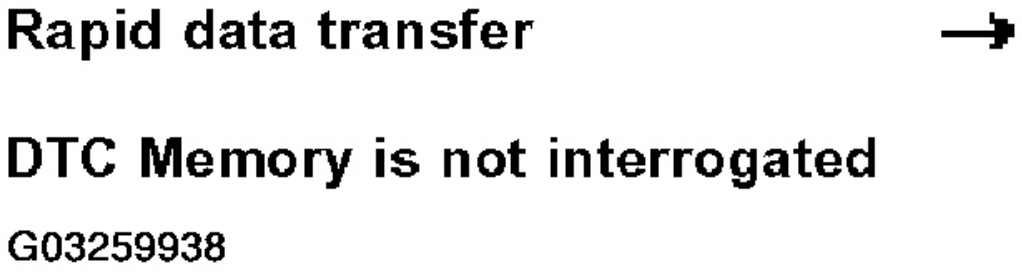


Fig. 11: Identifying Ignition Coil 4-Pin Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch on ignition.

  Specification: Min. 11.5 V

- Switch off ignition.

If no voltage is present:

- Check wiring for open circuit between 4 -pin connector terminal 1 and current supply relay for Motronic (main relay) using Electrical Wiring Diagrams.

  Wire resistance: max. 1.5 ohm

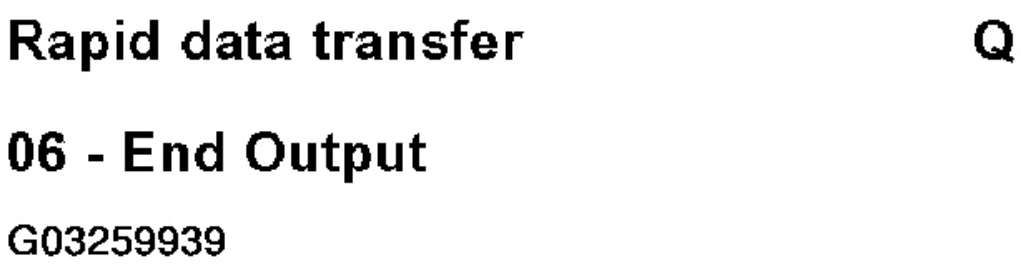


Fig. 12: Identifying Ignition Coil 4-Pin Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between 4 -pin connector and Ground (GND) for open circuit according to Electrical Wiring Diagrams.
  - Terminal 2 and Ground (GND)
  - Terminal 4 and Ground (GND)

  Wire resistance: max. 1.5 ohm

  If there is no malfunction in the supply voltage:

- Check activation, see **CHECKING ACTIVATION** .

Checking activation

WARNING: During the following test do not touch the connecting parts of the ignition coils or test cables.

- Pull fuse No. 32 out of fuse holder.

NOTE: Removing fuse 32 interrupts the voltage supply to the fuel injectors. Fuse holder is located behind access panel at far left end of dash.

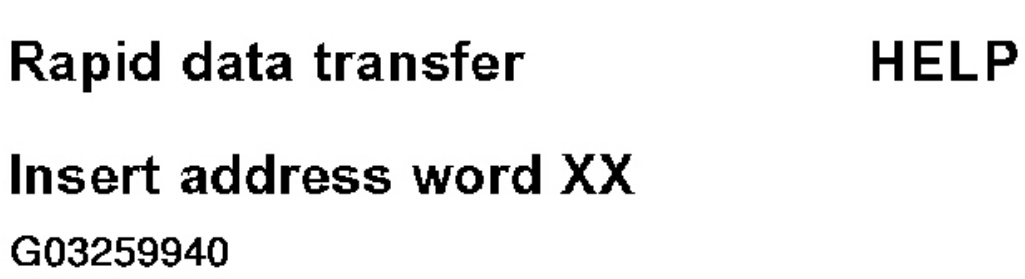


Fig. 13: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect V.A.G 1527 B voltage tester with adapter cables from V.A.G 1594 C to terminals of disconnected connector

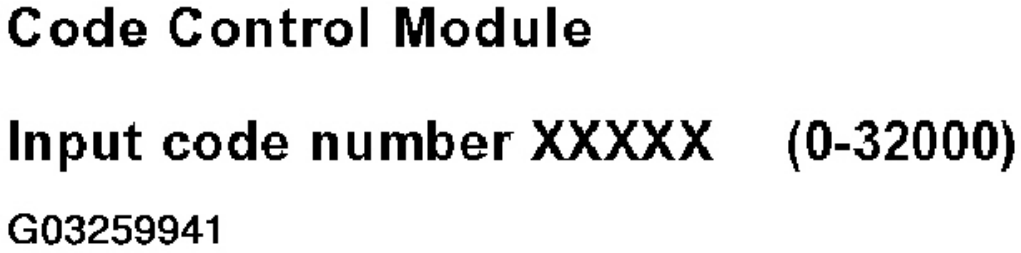


Fig. 14: Identifying Ignition Coil 4-Pin Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

  - Contacts 2 + 3
- Operate starter and check ignition signal from Engine Control Module.

  LED must flicker

- Switch off ignition.

When the LED flickers and the supply voltage is OK:

- Using removal tool T40039, replace ignition coil with power output stage, see item 2 .

- Check DTC Memory, if necessary, repair any malfunctions and then Erase DTC Memory, see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or Engine Control Module was disconnected from battery positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

  The LED does not flicker:

- Check wiring, see **CHECKING WIRING** .

Checking wiring

- Remove inner plenum chamber cover, left:

  See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING**

- Connect V.A.G 1598/31 test box to control module wiring harness. Engine Control Module is not connected by this action.

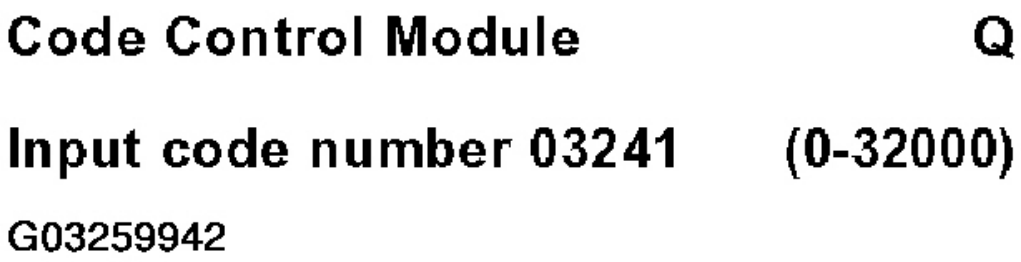


Fig. 15: Connect V.A.G 1598/31 Test Box To Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between test box and 4 -pin connector for open circuit according to Electrical Wiring Diagrams.

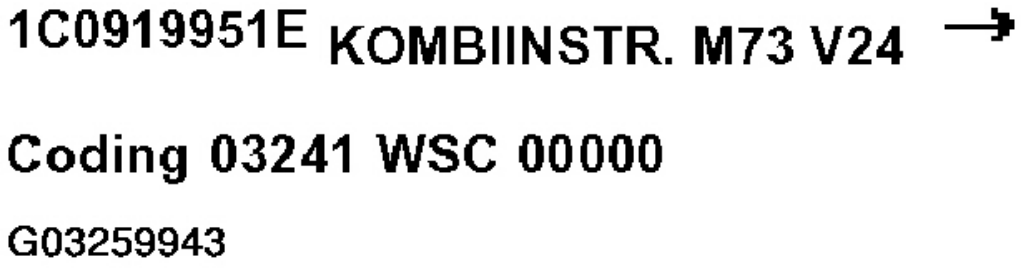


Fig. 16: Identifying Ignition Coil 4-Pin Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Cylinder 1 terminal 3 + socket 102
- Cylinder 2 terminal 3 + socket 95
- Cylinder 3 terminal 3 + socket 103
- Cylinder 4 terminal 3 + socket 94
- Wire resistance: Max. 1.5 ohm

- Additionally check wires for short to one another.

  Specification: ohm

  If no malfunction can be found in the wiring:

- Replace Engine Control Module (ECM), see **MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, REPLACING** .

Knock Sensors (KS), checking

NOTE:

- **It is extremely important to keep to the tightening torque of 20 Nm to ensure the Knock Sensors (KS) perform perfectly.**
- **Knock Sensors (KS) 1 -G61- and 2 -G66- have a direct 2 -pin connector and consequently no terminal for the shielding in the connector**
- **Only gold-plated terminals may be used when servicing the Knock Sensor (KS) connector terminals.**
- **Contact surfaces between Knock Sensor (KS) and cylinder block must be free of corrosion, dirt and grease.**

Special tools, test equipment and auxiliary items

- V.A.G 1551 scan tool (or V.A.G 1552 mobile scan tool) with V.A.G 1551/3B cable
- V.A.G 1598/31 test box
- V.A.G 1526 A or Fluke 83 multimeter
- V.A.G 1594 C adapter set
- Electrical Wiring Diagrams

Test conditions

- On Board Diagnostic (OBD) must have recognized a malfunction in one or both Knock Sensors (KS), see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING**
- Engine Coolant Temperature must be at least 85 ° C display group 28, display zone 3

Checking function

- Connect V.A.G 1551 scan tool (or V.A.G 1552 scan tool). Start engine and select "Address word" 01 of Engine Control Module. Engine must be running at idle speed. Connecting scan tool and selecting Engine Control Module, see **VAG 1551, CONNECTING AND SELECTING MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-** .

  Indicated on display

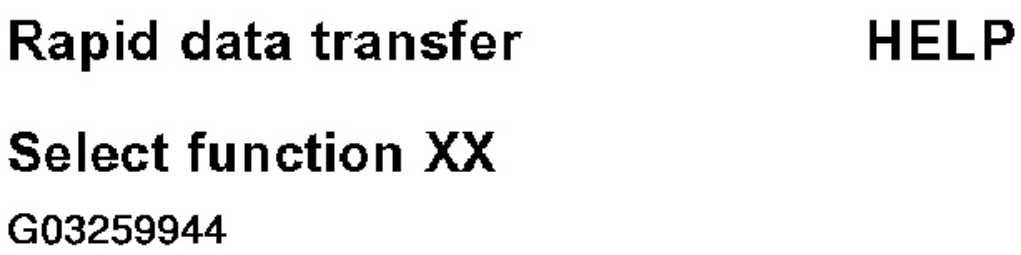


Fig. 17: Identifying Scan Tool Display - Knock Sensors, Checking (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press buttons -0- and -8- for the function "Read measured value block" and confirm entry with -Q- button.

  Indicated on display

Fig. 18: Identifying Scan Tool Display - Knock Sensors, Checking (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press buttons -0-, -2- and -8- for the "Display group number 28" and confirm entry with -Q- button.

Indicated on display (1--4 - Display zones)

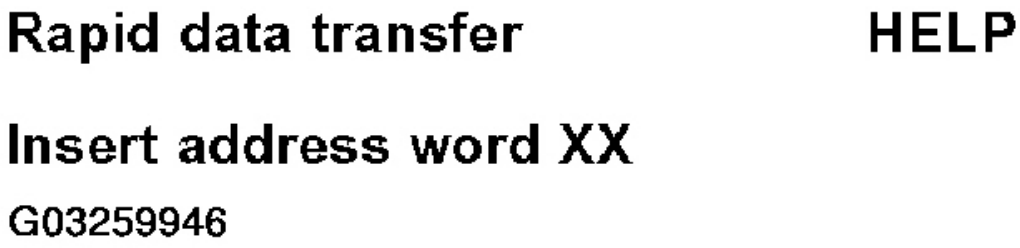


Fig. 19: Identifying Scan Tool Display - Knock Sensors, Checking (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Checking the Knock Sensors (KS) must be performed during a road test because the Knock Sensors (KS) OBD is not activated until the engine speed exceeds 2000 RPM and the engine is loaded by more than 40%.

- Perform a road test and check knock control specifications on display (display zone 4).

Observe the valid safety precautions when road testing, see **SAFETY PRECAUTIONS** .

DISPLAY GROUP 28: IGNITION, KNOCK CONTROL SPECIFICATION

Display zones				
1		**2**	**3**	**4**
Display group 28: ignition, knock control				
Display	xxxx RPM	xxx.x %	xxx.x °C	Test OFF/Test ON Syst. OK. Syst. n. OK.
Indicated	Engine speed (in steps of 40)	Engine load	Engine Coolant Temperature	OBD condition and OBD result
Working range	0 to 6800 RPM	0.0 to 175.0%	-40.0 to 115.0 ° C	-
Specification	at least 2200 RPM	> 40.0%	85.0 to 115.0 ° C	Syst. OK.
-		-	-	If the specifications are not achieved, see **CHECKING WIRING** , Continuation

If the specification is obtained:

- Press --> button.
- Press buttons -0- and -6- for function "End output" and confirm entry with -Q- button.
- Switch off ignition.

Continuation:

If the specifications are not obtained:

- Press --> button.
- Press buttons -0- and -6- for function "End output" and confirm entry with -Q- button.
- Switch off ignition.

Checking resistance of Knock Sensors (KS)

- Disconnect 2-pin harness connector to Knock Sensor (KS) 1 - G61- (item no. 1) and/or 2-pin harness connector to Knock Sensor (KS) 2 -G66- (item no. 7).

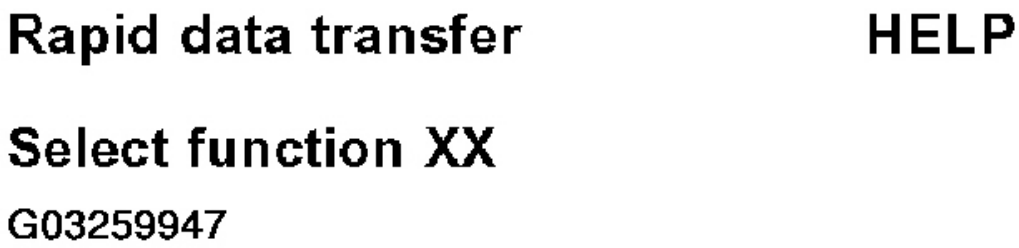


Fig. 20: Disconnecting 2-Pin Knock Sensor Harness Connectors
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between the terminals 1 + 2 at connections to Knock Sensors (KS).

Specification: ohm

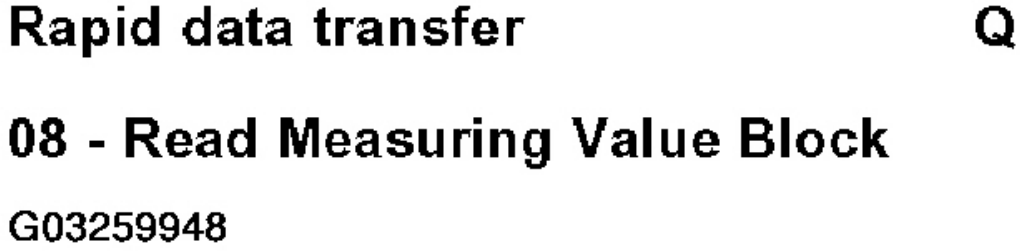


Fig. 21: Measuring Resistance Between Knock Sensor Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If the specification is not obtained:

- Replace Knock Sensors (KS) -G61- or -G66-, see item 12 or item 13 .
- Check DTC Memory, if necessary, repair any malfunctions and then Erase DTC Memory, see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or Engine Control Module was disconnected from battery positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

If the specification is obtained:

- Check wiring, see **CHECKING WIRING** .

Checking wiring

- Remove inner plenum chamber cover, left:

See **PLENUM CHAMBER INNER COVER, REMOVING AND INSTALLING** .

- Connect V.A.G 1598/31 test box to control module wiring harness. Engine Control Module is not connected by this action.

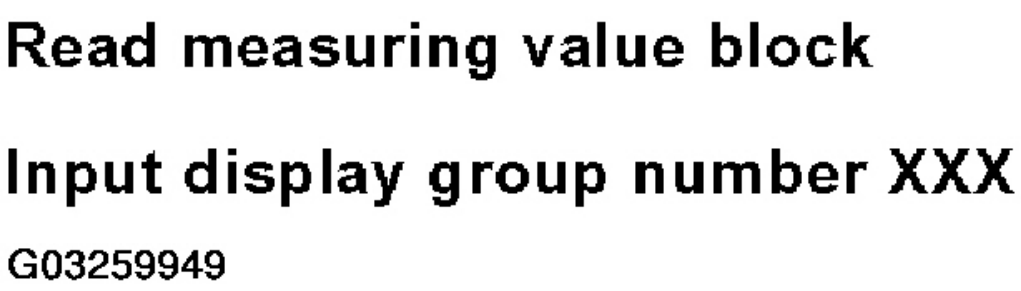


Fig. 22: Connecting V.A.G 1598/31 Test Box To Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wiring between test box and 2 -pin connector for open circuit using Electrical Wiring Diagrams.

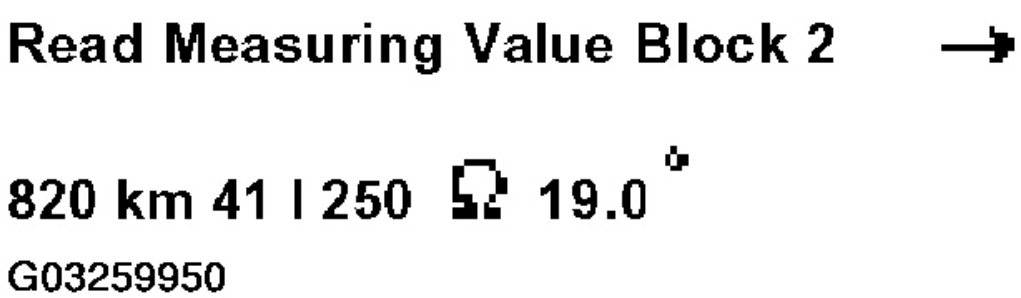


Fig. 23: Identifying Knock Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Knock Sensor -G61-: -G66-:

Contact 1 + socket 106 107

Contact 2 + socket 99 99

Wire resistance: Max. 1.5 ohm

- Additionally check wires at socket 99 for short to sockets 106 and 107.

Specification: ohm

If no malfunctions in wiring are detected:

- Loosen Knock Sensor (KS) and tighten again to 20 Nm.
- Perform a road test again and check knock control specifications on display.

  Observe the valid safety precautions when road testing, see **SAFETY PRECAUTIONS** .

  During the road test Engine Coolant Temperature must exceed 85 ° C

  When the temperature is reached, these operating conditions must be obtained several times:

  - Idle
  - Part throttle
  - Full throttle
  - Overrun
  - At full throttle the engine speed must exceed 3500 RPM.
- Again check control module DTC memory.

If the malfunction is still present:

- Replace Knock Sensors (KS) -G61- or -G66-, see item 12 or item 13 .
- Check DTC Memory, if necessary, repair any malfunctions and then Erase DTC Memory, see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING** .
- Read readiness code, see **READINESS CODE, DISPLAYING** . If DTC memory has been erased or Engine Control Module was disconnected from battery positive, readiness code must be generated again, see **READINESS CODE, GENERATING** .

Misfiring recognition, checking

Special tools, test equipment and auxiliary items

- V.A.G 1551 scan tool (or V.A.G 1552 mobile scan tool) with V.A.G 1551/3B cable

Test conditions

- Engine is OK mechanically.
- No DTCs must be stored in DTC memory, see **DTC MEMORY OF MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-, CHECKING AND ERASING**

Test sequence

- Connect V.A.G 1551 scan tool ((V.A.G 1552). Start engine and select "Address word" 01 of Engine Control Module. Engine must be running at idle speed. (Connecting scan tool and selecting Engine Control Module, see **VAG 1551, CONNECTING AND SELECTING MOTRONIC ENGINE CONTROL MODULE (ECM) -J220-**).

  Indicated on display

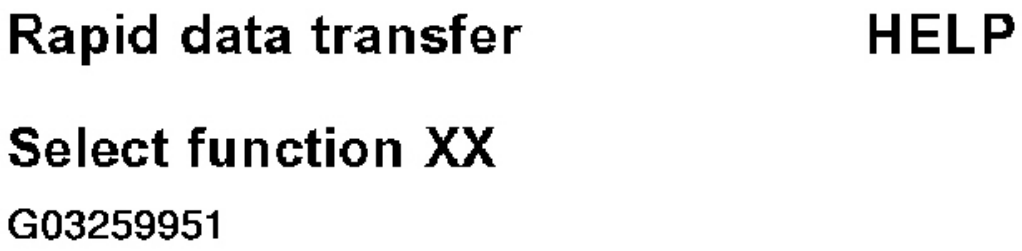


Fig. 24: Identifying Scan Tool Display - Misfiring Recognition, Checking (1 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press buttons -0- and -8- for the function "Read measured value block" and confirm entry with -Q- button.

Indicated on display

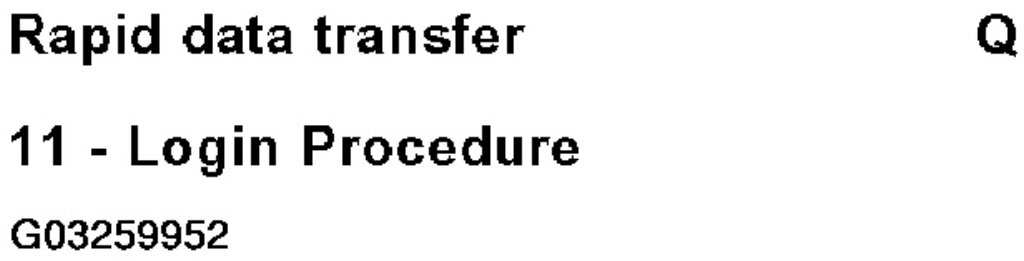


Fig. 25: Identifying Scan Tool Display - Misfiring Recognition, Checking (2 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Press buttons -0-, -1- and -4- for "Display group number 14" and confirm entry with -Q- button.

  Indicated on display (1--4 - Display zones)

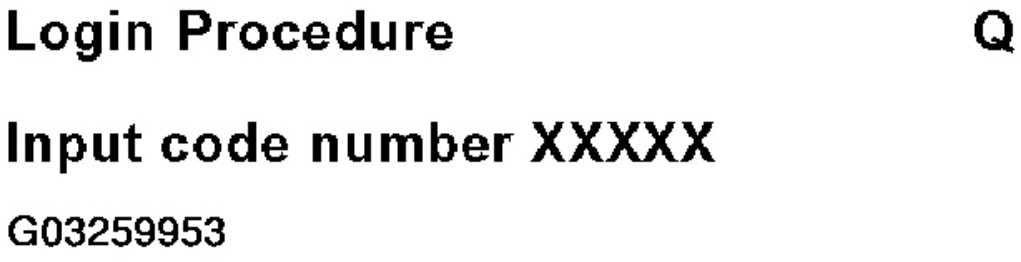


Fig. 26: Identifying Scan Tool Display - Misfiring Recognition, Checking (3 Of 3)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check total number of misfires in display zone 3.
- Check misfire recognition status in display zone 4.

DISPLAY GROUP 14: IGNITION, MISFIRE RECOGNITION SPECIFICATION

Display zones					
1		**2**	**3**	**4**	
Display group 14: ignition, misfire recognition					
Display	xxxx RPM	xxx.x %	xxx	Activated	

				Blocked	
Indicated	Engine speed	Engine load	Catalyst damaging	Misfire recognition	
(in 40 steps)		misfires (Total)			status
Working range: 0 to 6800 RPM: 0.0 to 175.0%			0 to 65000	-	
Specification	-	> 12.0%	0	activated	

If the specification is not obtained, see **Evaluating display group 14, display zone 3 - total number of catalyst damaging misfires**

If the specifications are obtained:

- Press --> button.
- Press buttons -0- and -6- for "End output" function and confirm input with -Q- button.
- Switch off ignition.

If the specifications are not obtained:

- Change to display group 15 as follows:
- Press button -3- ((V.A.G 1551 scan tool) or button UPARROW (V.A.G 1552 scan tool).

Indicated on display (1--4 - Display zones)

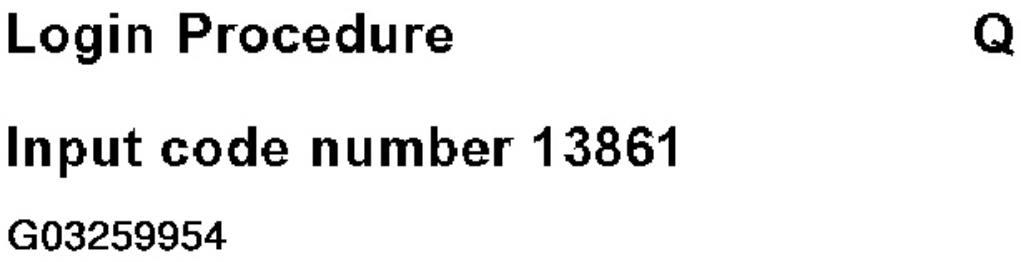


Fig. 27: Identifying Scan Tool Display - Read Measured Value Block 15
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check misfiring in display zones 1 to 3.
- Check misfire recognition status in display zone 4.

DISPLAY GROUP 15: IGNITION, MISFIRE RECOGNITION

Display zones			

1		2	3	4
Display group 15: ignition, misfire recognition				
Display	xxx	xxx	xxx	Activated Blocked
Indicated	Catalyst damaging	Catalyst damaging	Catalyst damaging	Misfire recognition
misfires Cyl. 1		misfires Cyl. 2	misfires Cyl. 3	status
Working range	0--65000	0--65000	0--65000	-
Specification	0	0	0	activated

If the specification is not obtained, see **Evaluating display group 15 display zones 1 to 3 and display group 16 display zone 1 - total number of catalyst damaging misfires Cyl. 1 to Cyl. 4**

If the specifications are obtained:

- Change to display group 16 as follows:
- Press button -3- ((V.A.G 1551 scan tool) or button UPARROW (V.A.G1552 scan tool).

  Indicated on display (1 and 4 - Display zones)

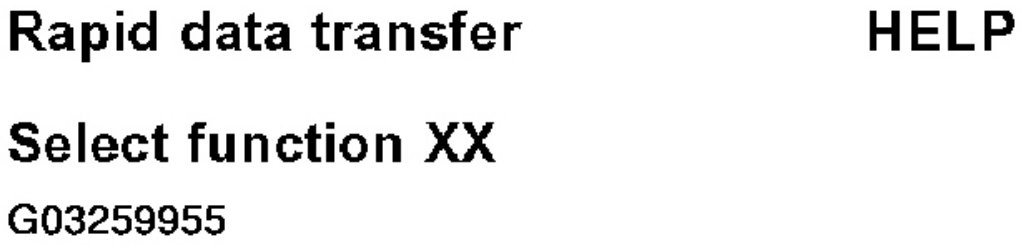


Fig. 28: Identifying Scan Tool Display - Read Measured Value Block 16
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check misfiring in display zone 1.
- Check misfire recognition status in display zone 4.

DISPLAY GROUP 16: IGNITION, MISFIRE RECOGNITION

Display zones				
1		**2**	**3**	**4**
Display group 16: ignition, misfire recognition				
Display	xxx	-	-	Activated Blocked

Indicated	Catalyst damaging misfires Cyl. 4	-	-	Misfire status recognition
Working range	0--65000	-	-	-
Specification	0	-	-	activated

If the specification is not obtained, see **Evaluating display group 15 display zones 1 to 3 and display group 16 display zone 1 - total number of catalyst damaging misfires Cyl. 1 to Cyl. 4**

- Press --> button.
- Press buttons -0- and -6- for "End output" function and confirm input with -Q- button.
- Switch off ignition.

Evaluating display group 14, display zone 3 - total number of catalyst damaging misfires

EVALUATING DISPLAY GROUP 14, DISPLAY ZONE 3 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES

Appears on display	Possible malfunction cause	Malfunction elimination
> 0	• Spark plug malfunctioning • Ignition coil with power output stage malfunctioning	• Check spark plugs, see **IGNITION/GLOW PLUG SYSTEM** • Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING**
	• Fuel injector malfunctioning	• Check fuel injectors, see **FUEL INJECTORS, CHECKING**

Evaluating display group 15 display zones 1 to 3 and display group 16 display zone 1 - total number of catalyst damaging misfires Cyl. 1 to Cyl. 4

EVALUATING DISPLAY GROUP 15 DISPLAY ZONES 1 TO 3 AND DISPLAY GROUP 16 DISPLAY ZONE 1 - TOTAL NUMBER OF CATALYST DAMAGING MISFIRES CYL. 1 TO CYL. 4

Appears on display	Possible malfunction cause	Malfunction elimination
> 0	• Spark plug malfunctioning • Ignition coil with power output stage malfunctioning • Fuel injector malfunctioning	• Check spark plugs, see **IGNITION/GLOW PLUG SYSTEM** • Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGE, CHECKING** • Check fuel injectors, see **FUEL INJECTORS, CHECKING**

IGNITION/GLOW PLUG SYSTEM

IGNITION, SERVICING

General notes on ignition system

- This section deals specifically with ignition-related components. The other components of the injection and ignition system. See **MULTIPORT FUEL INJECTION (MFI)** .
- For the electric components to work properly, a voltage of at least 11.5 V is required.
- The battery must only be disconnected and connected with the ignition switched off, since the Engine Control Module (ECM) can otherwise be damaged.
- The Engine Control Module (ECM) is equipped with an On Board Diagnostic (OBD)
- Components marked with * are tested via On Board Diagnostic (OBD). See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- It is possible that the control module will recognize a malfunction and store a DTC during some tests. Therefore the following work steps must be performed in the mentioned sequence after ending all tests and repairs.
  - Check DTC memory. See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
  - Erase DTC memory. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
  - For completion, generate readiness code. See **READINESS CODE, GENERATING** .

Parts of ignition, removing and installing:

- Vehicles with engine code AEG. See **PARTS OF THE IGNITION, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE AEG)** .
- Vehicles with engine code AVH, AZG, BDC. See **PARTS OF THE IGNITION, REMOVING AND INSTALLING (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

Safety precautions. See **SAFETY PRECAUTIONS** .

Test data, spark plugs. See **TEST DATA, SPARK PLUGS** .

Parts of the ignition, removing and installing (Vehicles with engine code AEG)

NOTE: Engine Control Module (ECM) with harness connectors. See item 5 in OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AEG) .

NOTE: The following list refers to Fig. 1 .

1. **10 Nm**
2. **Ignition wire**
   - 4 to 8 k ohm
   - with interference suppression connector and spark plug connector
3. **Spark plug, 30 Nm**
   - Type and spark plug gap. See **TEST DATA, SPARK PLUGS** .
4. **20 Nm**
   - Tightening torque affects function of Knock Sensor (KS)
5. **Knock Sensor (KS) 2 (G66)***
   - Component location. See item 14 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AEG)** .
   - Terminals of sensor and connector are gold-plated
   - contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease
   - Checking. See **CHECK KNOCK SENSORS** .
6. **Connector**
   - brown, 2-pin
   - For Knock Sensor (KS) 2 -G66-
   - before disconnecting, mark allocation of connector to component
   - Terminals of sensor and connector are gold-plated
7. **Knock Sensor (KS) 1 (G61)***
   - Component location. See item 15 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AEG)** .
   - Terminals of sensor and connector are gold-plated
   - contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease Checking. See **CHECK KNOCK SENSORS** .
8. **Connector**
   - black, 2-pin
   - For Knock Sensor (KS) 1 -G61-
   - before disconnecting, mark allocation of connector to component
   - Terminals of sensor and connector are gold-plated
9. **Camshaft Position (CMP) sensor (G40)***
   - Component location. See item 17 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AEG)** .
   - Terminals of sensor and connector are gold-plated
   - Checking. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
10. **Connector**
    - black, 3-pin
    - For Camshaft Position (CMP) sensor 2 -G40-

- Terminals of sensor and connector are gold-plated

11. **Connector**
    - Black, 4-pin
    - for Ignition Coil -N152-
12. **Ignition Coil -N152-***

- Component location. See item 12 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AEG)** .
- with marking for ignition wires: A = Cylinder 1B = Cylinder 3C = Cylinder 2D = Cylinder 4
- Checking. See **CHECKING IGNITION COIL (VEHICLES WITH ENGINE CODE AEG)** .

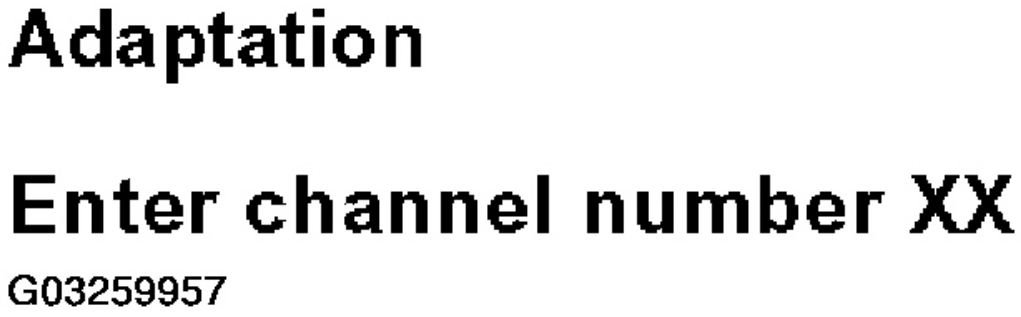


Fig. 1: Identifying Parts Of Ignition System (Vehicles With Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Parts of the ignition, removing and installing (Vehicles with engine code AVH, AZG, BDC)

NOTE: Engine Control Module (ECM) with connectors:

- Vehicles with engine code AVH, AZG. See item 11 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AVH, AZG)** .
- Vehicles with engine code BDC. See item 12 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE BDC)** .

NOTE: The following list refers to Fig. 2 .

1. **Ignition wire**
    - 4 to 8 k ohm
    - with interference suppression connector and spark plug connector

2. Ignition coil with power output stage (-N70-, -N127-, -N291-, -N292-)*
   - Ignition wires connection: HV1 = Cylinder 1HV2 = Cylinder 2HV3 = Cylinder 3HV4 = Cylinder 4
   - Checking. See **CHECKING IGNITION COILS WITH POWER OUTPUT STAGES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

     Component location:

   - Vehicles with engine code AVH, AZG. See item 18 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AVH, AZG)** .
   - Vehicles with engine code BDC. See item 19 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE BDC)** .
3. **10 Nm**
4. **Connector**
   - 6-pin
5. **Knock Sensor (KS) 1 (G61)***
   - contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease
   - Terminals of sensor and connector are gold-plated
   - Checking. See **CHECK KNOCK SENSORS** .

     Component location:

   - Vehicles with engine code AVH, AZG. See item 27 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AVH, AZG)** .
   - Vehicles with engine code BDC. See item 25 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE BDC)** .
6. **Connector**
   - 2-pin
   - For Knock Sensor (KS) 1 -G61-
   - before disconnecting, mark allocation of connector to component
   - Terminals of sensor and connector are gold-plated
7. **Knock Sensor (KS) 2 (G66)***
   - contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease
   - Terminals of sensor and connector are gold-plated
   - Checking. See **CHECK KNOCK SENSORS** .

     Component location:

   - Vehicles with engine code AVH, AZG. See item 24 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AVH, AZG)** .
   - Vehicles with engine code BDC. See item 24 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE BDC)** .

8. **Connector**
    - 2-pin
    - For Knock Sensor (KS) 2 -G66-
    - before disconnecting, mark allocation of connector to component
    - Terminals of sensor and connector are gold-plated
9. **Connector**
    - 2-pin
    - For Knock Sensor (KS) 1 -G61-
    - before disconnecting, mark allocation of connector to component
    - Terminals of sensor and connector are gold-plated
10. **Spark plug, 30 Nm**
    - Type and spark plug gap. See **TEST DATA, SPARK PLUGS** .
11. **Connector**
    - 3-pin
    - For Camshaft Position (CMP) sensor 2 -G40-
    - Terminals of sensor and connector are gold-plated
12. **10 Nm**
13. **100 Nm**
    - Use Retainer (3415) when loosening or tightening
14. **Camshaft gear**
    - with trigger wheel for Camshaft Position (CMP) Sensor -G40-
15. **Camshaft Position (CMP) sensor (G40)***
    - Terminals of sensor and connector are gold-plated
    - Checking. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .

      Component location:

    - Vehicles with engine code AVH, AZG. See item 2 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE AVH, AZG)** .
    - Vehicles with engine code BDC. See item 4 in **OVERVIEW OF COMPONENT LOCATIONS (VEHICLES WITH ENGINE CODE BDC)** .
16. **Bracket**
    - for Camshaft Position (CMP) sensor

adaptation

Enter channel number 09

G03259958

Fig. 2: Identifying Parts Of Ignition System (Vehicles With Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Safety precautions

WARNING: Observe the following for all installations, especially in engine compartment due to lack of room:

- **Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.**
- **Watch for sufficient clearance to all moving or hot components.**
- **Fuel system is under pressure! Before opening system, place rags around the connection point. Then release pressure by carefully loosening connection.**

If test and measuring equipment is required during road test, note the following:

- Test equipment must always be secured to the rear seat and operated from there by a second person.

  If test and measuring equipment is operated from the passenger seat, the person seated there could be injured in the event of an accident involving deployment of the passenger -side airbag.

  To reduce the risk of personal injury and/or damage to the fuel injection and ignition system, always observe the following:

- Do not touch or disconnect ignition wires when engine is running or turning at starting RPM.
- Only disconnect and reconnect wires for injection and ignition system, including test leads, when ignition is switched off.
- If engine is to be cranked at starting RPM without starting, e.g. for a compression test:

Vehicles with engine code AEG

- Disconnect 4-pin connector from Ignition Coil -N152- (arrow).

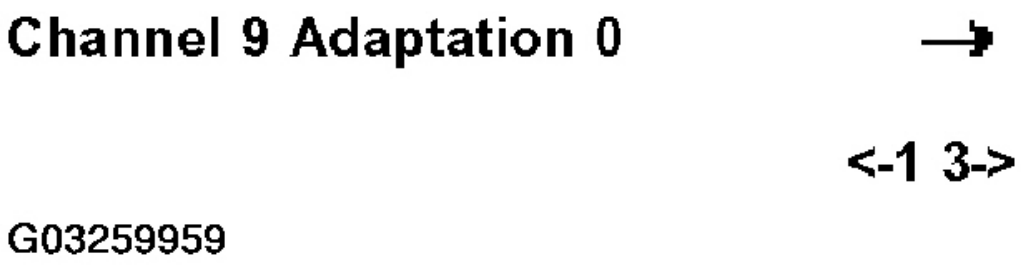


Fig. 3: Disconnecting 4-Pin Connector From Ignition Coil -N152- (AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with engine code AVH, AZG, BDC

- Disconnect the 6-pin connector from the power output stage for ignition coils (arrow).

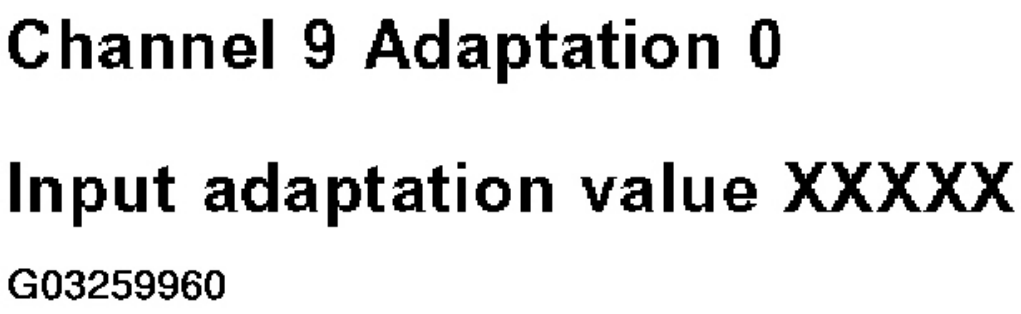


Fig. 4: Disconnecting 6-Pin Connector From Power Output Stage For Ignition Coils (AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Continuation for all vehicles

- Remove fuse 32 from fuse holder.

NOTE: By removing fuse 32, voltage supply to the fuel injectors is interrupted.

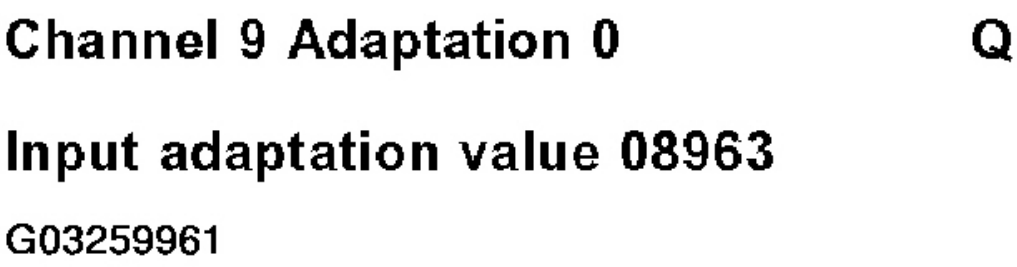


Fig. 5: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Fuse holder is located behind access panel at far left end of dash.

Test Data, Spark Plugs

SPARK PLUGS TEST DATA

Engine Code	**AEG**	**AVH, AZG, BDC**
Ignition sequence	1-3-4-2	1-3-4-2
Spark plugs		
VW/Audi	101 000 033 AA	101 000 062 AB
Manufacturer code	BKUR 6ET-10	PZF R5D-11
Tightening torque	30 Nm	30 Nm
Spark plug gap	max. 0.9 to 1.1 mm	max. 0.9 to 1.1 mm
Engine Control Module (ECM)(1)		
System identification	Motronic M5.9.2	Motronic ME7.5
Terminals at Engine Control Module (ECM)	80	121
Part number	See Parts catalog	See Parts catalog
Engine speed (RPM) limitation	starting at approx. 6300 RPM	starting at approx. 6300 RPM
(1) Replacing Engine Control Module (ECM). See **REPLACING ENGINE CONTROL MODULE (ECM)** .		

Check Camshaft Position (CMP) sensor

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- The respective fuses of Motronic Engine Control Module (ECM) -J220- must be OK.

NOTE: Fuse holder is located behind access panel at far left end of dash.

Fig. 6: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- Ground (GND) connections between engine and chassis must be OK.

Test sequence (Vehicles with engine code AEG)

Test sequence (Vehicles with engine code AVH, AZG, BDC). See **TEST SEQUENCE (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .

- Remove engine cover.
- Disconnect the 3-pin connector from Camshaft Position (CMP) Sensor -G40- (arrow).

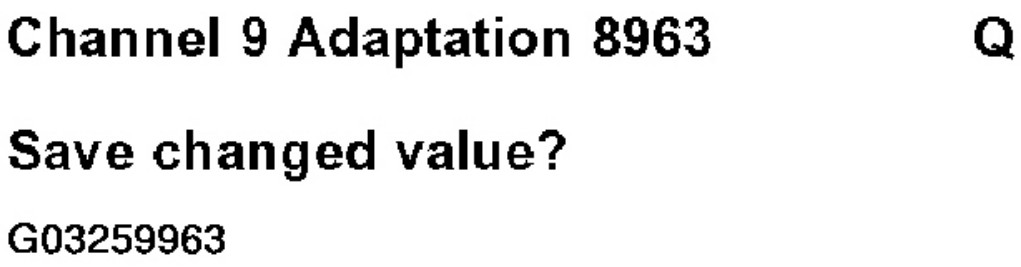


Fig. 7: Disconnecting 3-Pin Connector From Camshaft Position Sensor -G40- (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect multimeter to terminal 1 (B+) and 3 (Ground -GND-) of connector for Camshaft Position (CMP) sensor for voltage measurement.

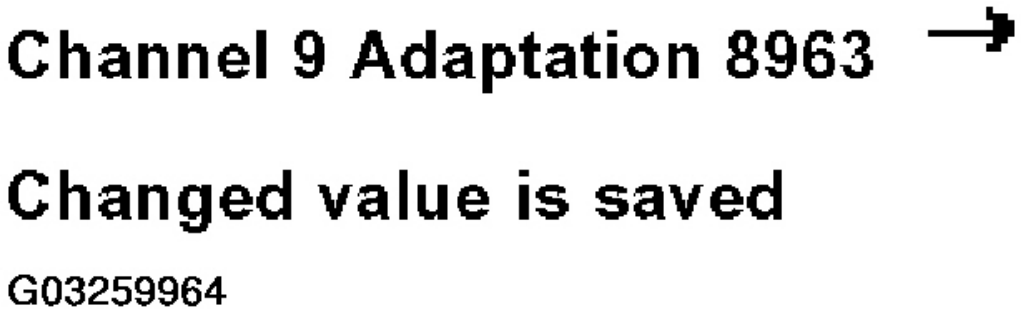


Fig. 8: Connecting Multimeter To ECT Sensor Harness Connector Terminal 1 And 3 Of (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch ignition on. Specified value: at least 4.5 V
- Switch ignition off.

If there is no voltage:

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .

- Check for open circuits in wires between test box and connector according to wiring diagram.

  Terminal 1 + socket 62

  Terminal 2 + socket 76

  Terminal 3 + socket 67

  Wire resistance: max. 1.5 ohm

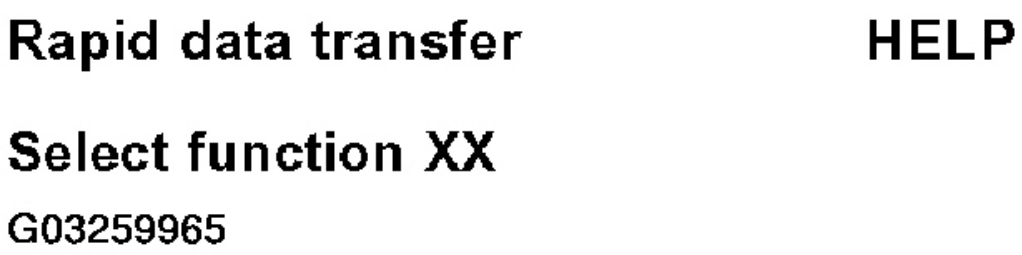


Fig. 9: Identifying ECT Sensor Harness Connector Terminals (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

  If no malfunctions are found in the wires and there was voltage between terminals 1 + 3:

- Replace Camshaft Position (CMP) Sensor -G40-. See item 9 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If no malfunctions are found in wires and there was no voltage between terminals 1 + 3:

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

Test sequence (Vehicles with engine code AVH, AZG, BDC)

- Disconnect the 3-pin connector from Camshaft Position (CMP) Sensor (arrow).

Fig. 10: Disconnecting 3-Pin Connector From Camshaft Position Sensor (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect multimeter to terminal 1 (B+) and 3 (Ground -GND-) of connector for Camshaft Position (CMP) sensor for voltage measurement.

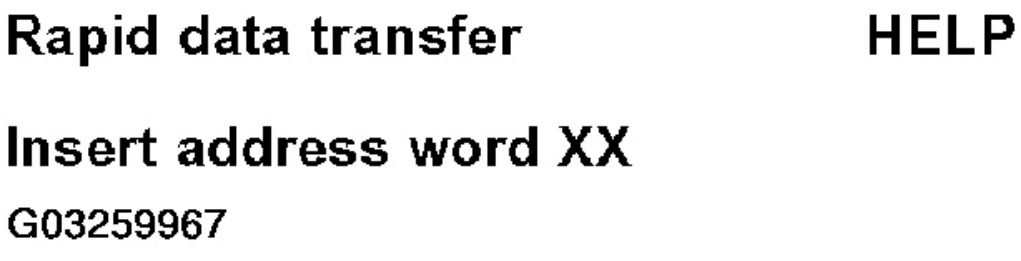


Fig. 11: Connecting Multimeter To Camshaft Position Sensor Harness Connector Terminal 1 And 3 (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch ignition on. Specified value: 4.0 to 6.0 V
- Switch ignition off.

If there is no voltage:

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check for open circuits in wires between test box and connector according to wiring diagram.

Terminal 1 + socket 98

Terminal 2 + socket 86

Terminal 3 + socket 108

Wire resistance: max. 1.5 ohm

Fig. 12: Identifying Camshaft Position Sensor Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

  If no malfunctions are found in the wires and there was voltage between terminals 1 + 3:

- Replace Camshaft Position (CMP) Sensor -G40-. See item 15 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

  If no malfunctions are found in wires and there was no voltage between terminals 1 + 3:

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

Check knock sensors

NOTE:

- **Contact surfaces between knock sensor and cylinder block must be free of corrosion, dirt and grease.**
- **For the Knock Sensors to function properly, it is important for tightening torque to be exactly 20 Nm.**

- **Use only gold-plated terminals when servicing terminals in harness connector of knock sensors.**

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- Securing bolt for knock sensors tightened to 20 Nm.
- Ignition switched off.

Checking resistances and wires (Vehicles with engine code AEG)

- Checking resistances and wires (Vehicles with engine code AVH, AZG, BDC). See **CHECKING RESISTANCES AND WIRES (VEHICLES WITH ENGINE CODE AVH, AZG, BDC)** .
- Disconnect 2-pin connectors from knock sensors.

1. Knock Sensor (KS) 1 -G61-
2. Knock Sensor (KS) 2 -G66-

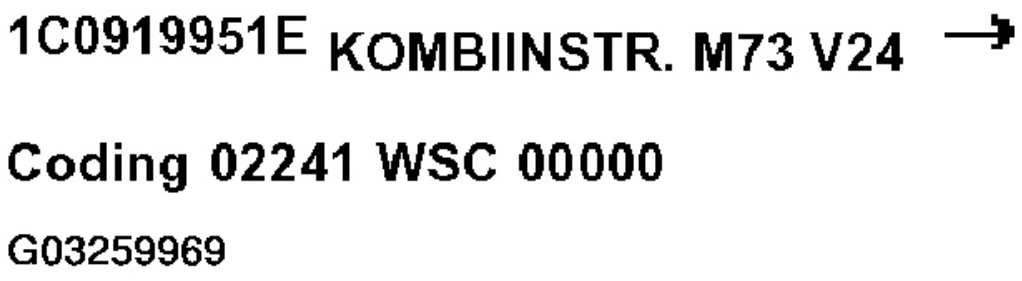


Fig. 13: Disconnecting 2-Pin Connectors From Knock Sensors (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Before disconnecting harness connectors, mark allocation to component.

- Measure resistance between terminals 1 + 2 at connectors to knock sensors. Specified value: INFINITY ohm

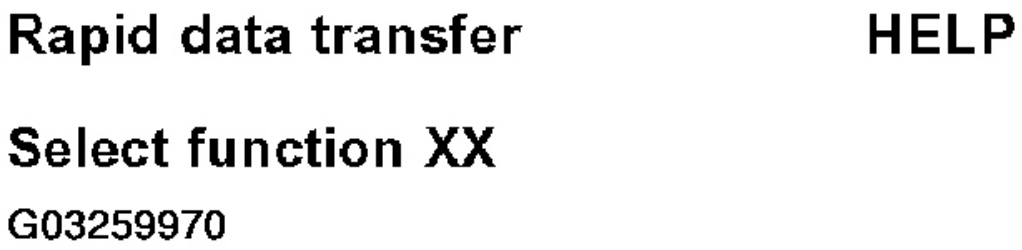


Fig. 14: Measuring Resistance Between Knock Sensor Terminals 1 And 2 (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check wires between test box and 2-pin connector to Engine Control Module (ECM) for open circuit according to wiring diagram. Wire resistance: max. 1.5ohm

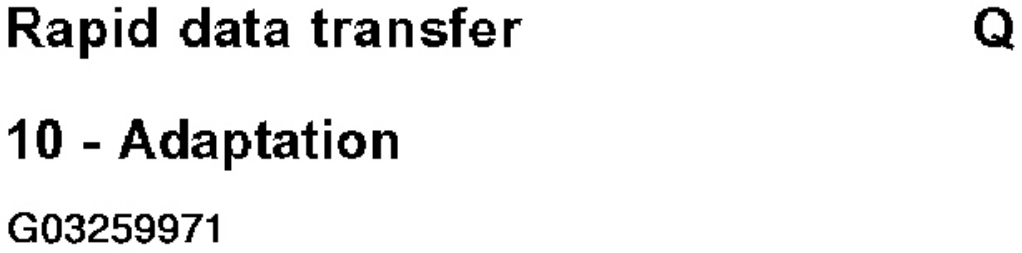


Fig. 15: Identifying Knock Sensor 2-Pin Harness Connector Terminals (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

KNOCK SENSOR WIRING TEST (ENGINE CODE AEG)

Component	Connector	Test box
Knock Sensor (KS) 1 -G61-	Terminal 1	Socket 68
	Terminal 2	Socket 67
Knock Sensor (KS) 2 -G66-	Terminal 1	Socket 60
	Terminal 2	Socket 67

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

If resistances and wires are OK:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-. See item 7 .
  - Knock Sensor (KS) 2 -G66-. See item 5 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Checking resistances and wires (Vehicles with engine code AVH, AZG, BDC)

- Disconnect 2-pin connectors from knock sensors.

1. Knock Sensor (KS) 1 -G61-
2. Knock Sensor (KS) 2 -G66-

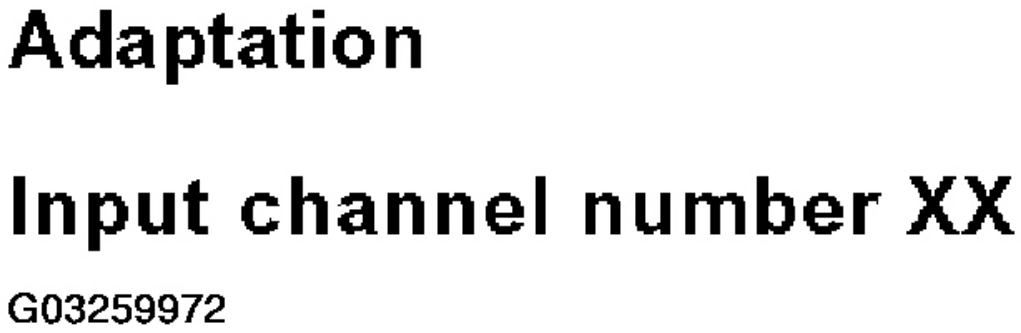


Fig. 16: Disconnecting 2-Pin Connectors From Knock Sensors (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: Before disconnecting harness connectors, mark allocation to component.

- Measure resistance between terminals 1 + 2 at connectors to knock sensors. Specified value: INFINITY ohm

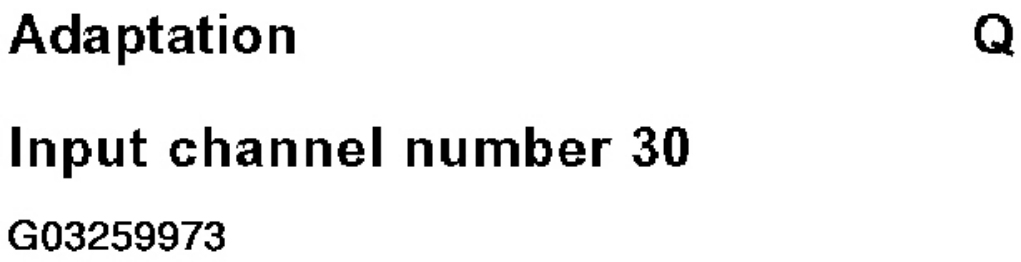


Fig. 17: Measuring Resistance Between Knock Sensor Terminals 1 And 2 (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check wires between test box and 2-pin connector to Engine Control Module (ECM) for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

Fig. 18: Identifying Knock Sensor 2-Pin Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

KNOCK SENSOR WIRING TEST (ENGINE CODE AVH, AZG, BDC)

Component	Connector	Test box
Knock Sensor (KS) 1 -G61-	Terminal 1	Socket 106
	Terminal 2	Socket 99
Knock Sensor (KS) 2 -G66-	Terminal 1	Socket 107

	Terminal 2	Socket 99

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

  If resistances and wires are OK:

- Replace the respective knock sensor:
  - Knock Sensor (KS) 1 -G61-. See item 5 .
  - Knock Sensor (KS) 2 -G66-. See item 7 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Checking ignition coil (Vehicles with engine code AEG)

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1527 voltage test lamp
- VAG1594 connector test kit
- Wiring diagram

Test requirements

- The respective fuses of Ignition Coil -N152- must be OK.

NOTE: Fuse holder is located behind access panel at far left end of dash.

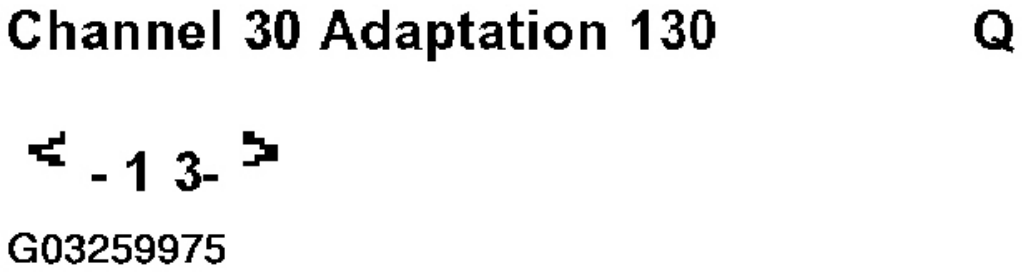


Fig. 19: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Fuel Pump (FP) Relay -J17- must be OK, check:
- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Engine speed (RPM) sensor must be OK, checking. See **CHECK ENGINE SPEED (RPM) SENSOR** .
- Camshaft Position (CMP) sensor must be OK, checking. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
- Ignition switched off.

Test sequence

- Disconnect 4-pin connector from Ignition Coil -N152- (arrow).

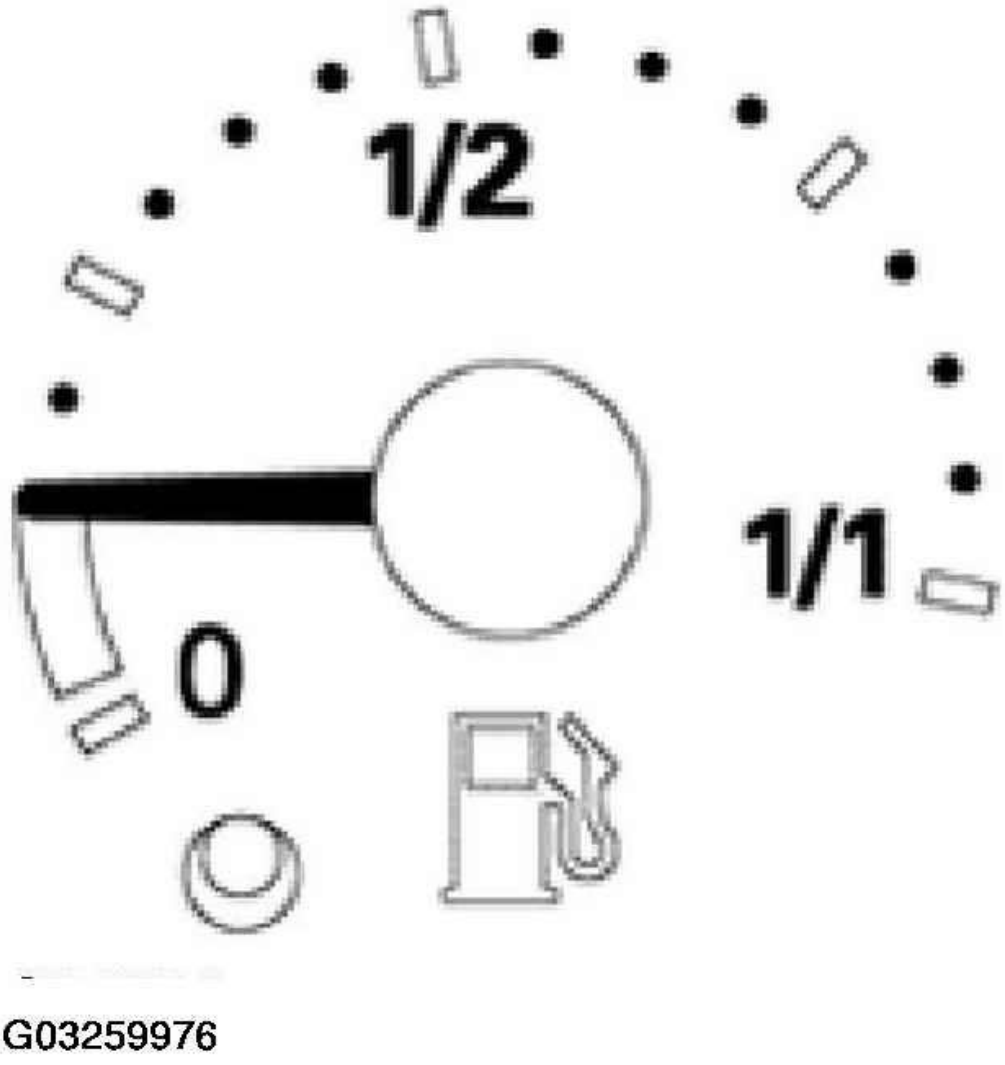


Fig. 20: Disconnecting 4-Pin Connector From Ignition Coil -N152- (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking voltage supply

- Connect multimeter to terminals 2 + 4 of the disconnected connector for voltage measurement.

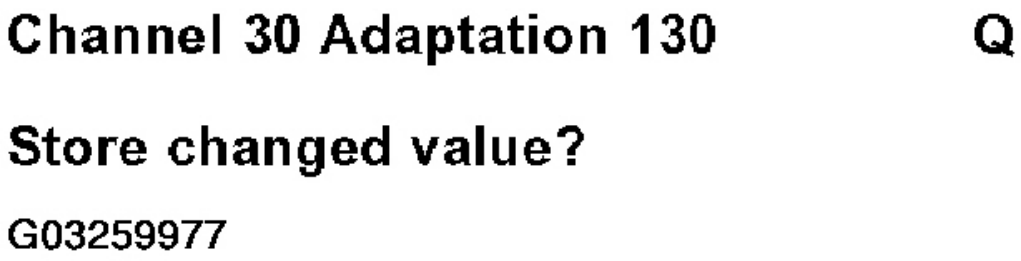


Fig. 21: Connecting Multimeter To Igntion Coil Harness Connector Terminals 2 And 4 (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch on ignition. Specified value: at least 11.5 V
- Switch ignition off.

If there is no voltage:

- Check wire between 4-pin connector terminal 2 and relay carrier for open circuits according to wiring diagram. Wire resistance: max. 1.5 ohm

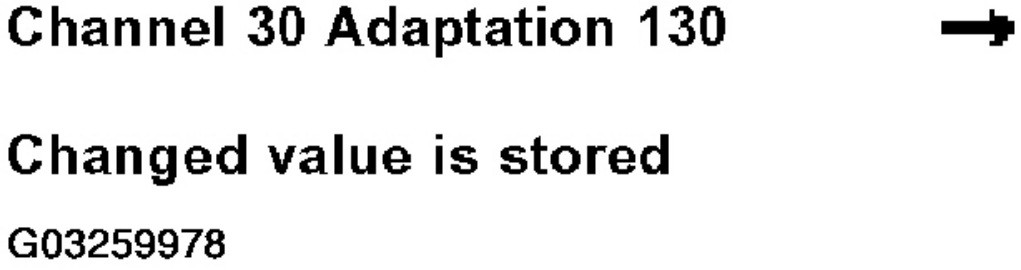


Fig. 22: Identifying Igntion Coil Harness Connector Terminals (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check for open circuit in wire between 4-pin connector terminal 4 and Ground (GND) according to wiring diagram. Wire resistance: max. 1.5 ohm

If there is no malfunction in voltage supply:

- Check activation. See **CHECKING ACTIVATION** .

Checking activation

WARNING: Do not touch ignition coil connecting parts or adapter cables during the following test.

- Remove fuse 32 from fuse holder. Fuse holder is located behind access panel at far left end of dash.

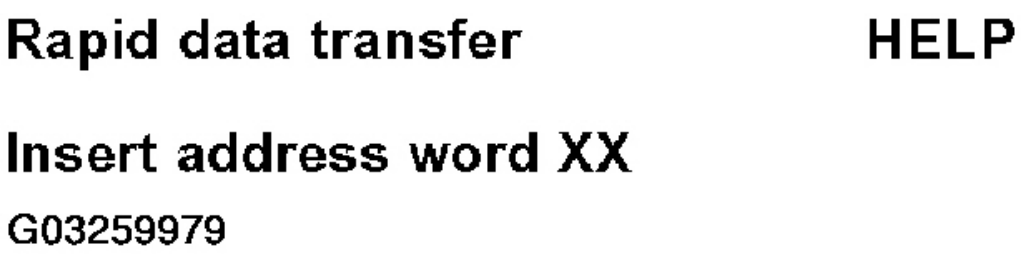


Fig. 23: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: By removing fuse 32, voltage supply to the fuel injectors is interrupted.

- Using adapter cables, connect voltage tester (VAG1527) to terminals 1 + 4 (ignition output 1), terminals 3 + 4 (ignition output 2), of disconnected connector.

Fig. 24: Identifying Ignition Coil Harness Connector Terminals (Engine Code AEG)

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate starter and test ignition signal from Engine Control Module (ECM). LED should flicker.
- Switch ignition off.

If LED flickers and voltage supply is OK:

- Replace Ignition Coil -N152-. See item 12 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If LED does not flicker:

- Check wires. See **CHECKING WIRING** .

Checking wiring

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check wires between test box and 4-pin connector for open circuit according to wiring diagram.

Terminal 1 + socket 71

Terminal 3 + socket 78

Wire resistance: max. 1.5 ohm

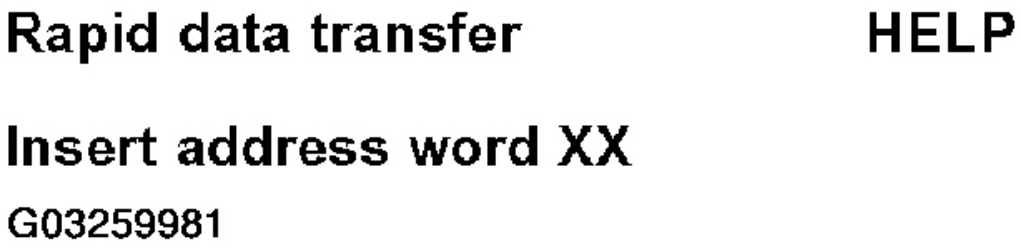


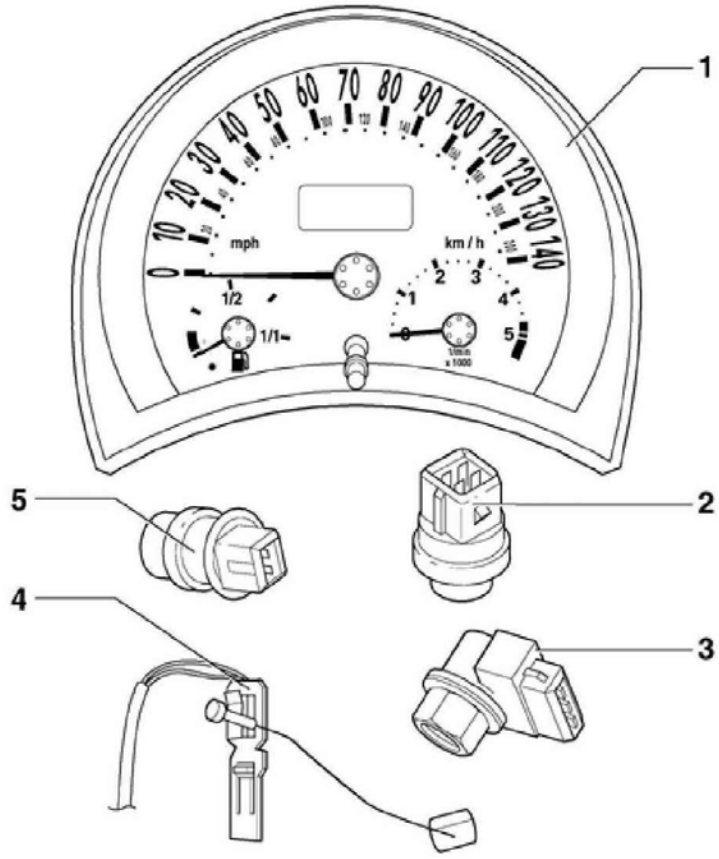
Fig. 25: Identifying Ignition Coil Harness Connector Terminals (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

- If no malfunctions are found in the wires and there was voltage between terminal 2 + 4:
- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .

Checking secondary resistances

- Check secondary resistances at terminal 4 between Cyl. 1 + Cyl. 4, Cyl. 2 + Cyl. 3. Specified value: 4.0... 6.0 k ohm



1 - Instrument cluster -K-

2 - Engine coolant temperature (ECT) sensor -G2-

3 - Speedometer vehicle speed sensor (VSS) -G22-

4 - Sender for fuel gauge sender -G-

5 - Outside air temperature sensor -G17-

G03259982

Fig. 26: Checking Secondary Resistances At Terminal 4 Between Cyl. 1 And Cyl. 4, Cyl. 2 And Cyl. 3 (Engine Code AEG)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If specified values are not obtained:

- Replace Ignition Coil -N152-. See item 12 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

Checking ignition coils with power output stages (Vehicles with engine code AVH, AZG, BDC)

NOTE: Ignition coils and power output stages are one component and cannot be replaced individually.

Special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1527 voltage test lamp
- VAG1594 connector test kit
- VAG1598/31 test box
- Wiring diagram

Test requirements

- The respective fuses of ignition coils must be OK.

NOTE: Fuse holder is located behind access panel at far left end of dash.

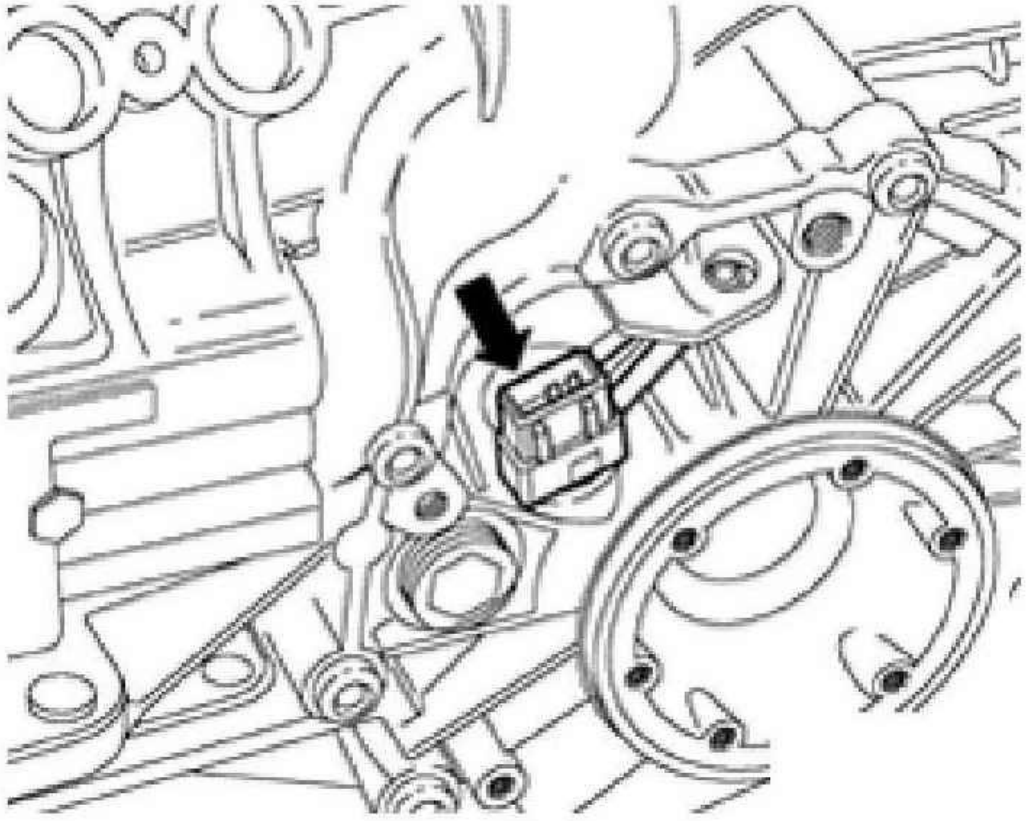


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Fig. 27: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Motronic Engine Control Module (ECM) Power Supply Relay -J271- must be OK.
- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Engine speed (RPM) sensor must be OK, checking. See **CHECK ENGINE SPEED (RPM) SENSOR** .
- Camshaft Position (CMP) sensor must be OK, checking. See **CHECK CAMSHAFT POSITION (CMP) SENSOR** .
- Ignition switched off.

Test sequence

- Disconnect the 6-pin connector from the power output stage for ignition coils (arrow).

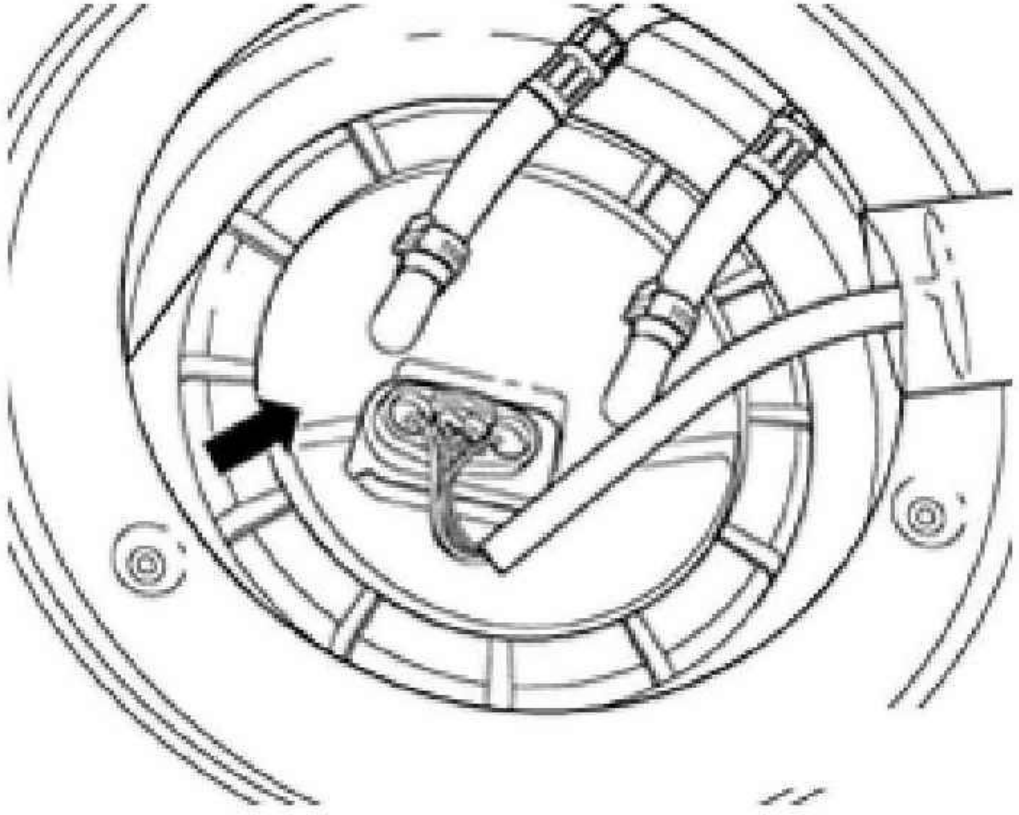

Fig. 28: Disconnecting 6-Pin Connector From Power Output Stage For Ignition Coils (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Checking voltage supply

- Use multimeter and adapter cables to measure voltage supply between terminals 1 + 6 of the disconnected connector.

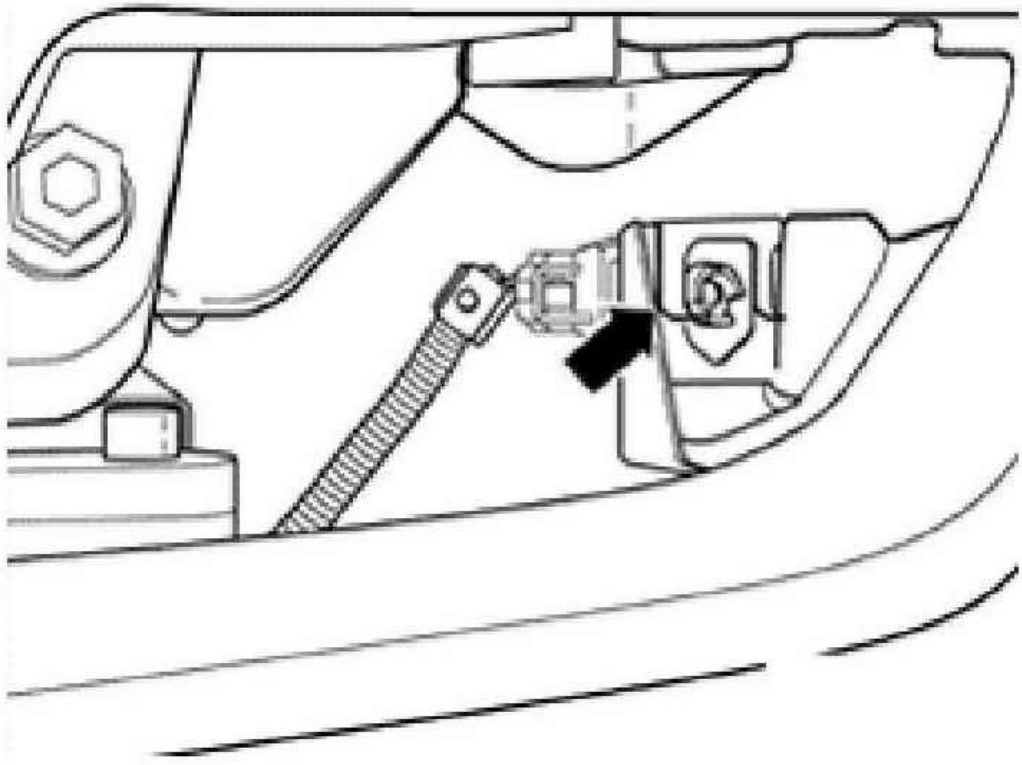

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Fig. 29: Identifying Ignition Coil 6-Pin Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch on ignition. Specified value: at least 11.5 V
- Switch ignition off.

If there is no voltage:

- Check wire between 6-pin connector terminal 6 and Motronic Engine Control Module (ECM) Power Supply Relay -J271- for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

Fig. 30: Identifying Ignition Coil 6-Pin Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wires between 6-pin connector terminal 1 and Ground (GND) for open circuit according to wiring diagram. Wire resistance: max. 1.5 ohm

If there is no malfunction in voltage supply:

- Check activation. See **CHECKING ACTIVATION** .

Checking activation

WARNING: Do not touch ignition coil connecting parts or adapter cables during the following test.

- Remove fuse 32 from fuse holder. Fuse holder is lcoated behind access panel at far left end of dash.

Fig. 31: Locating Fuse 32
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: By removing fuse 32, voltage supply to the fuel injectors is interrupted.

- Using adapter cables, connect voltage tester (VAG1527) to

  Terminals 1 + 2 (ignition output 1)

  Terminals 1 + 3 (ignition output 2)

  Terminals 1 + 4 (ignition output 3)

  Terminals 1 + 5 (ignition output 4) of disconnected connector.

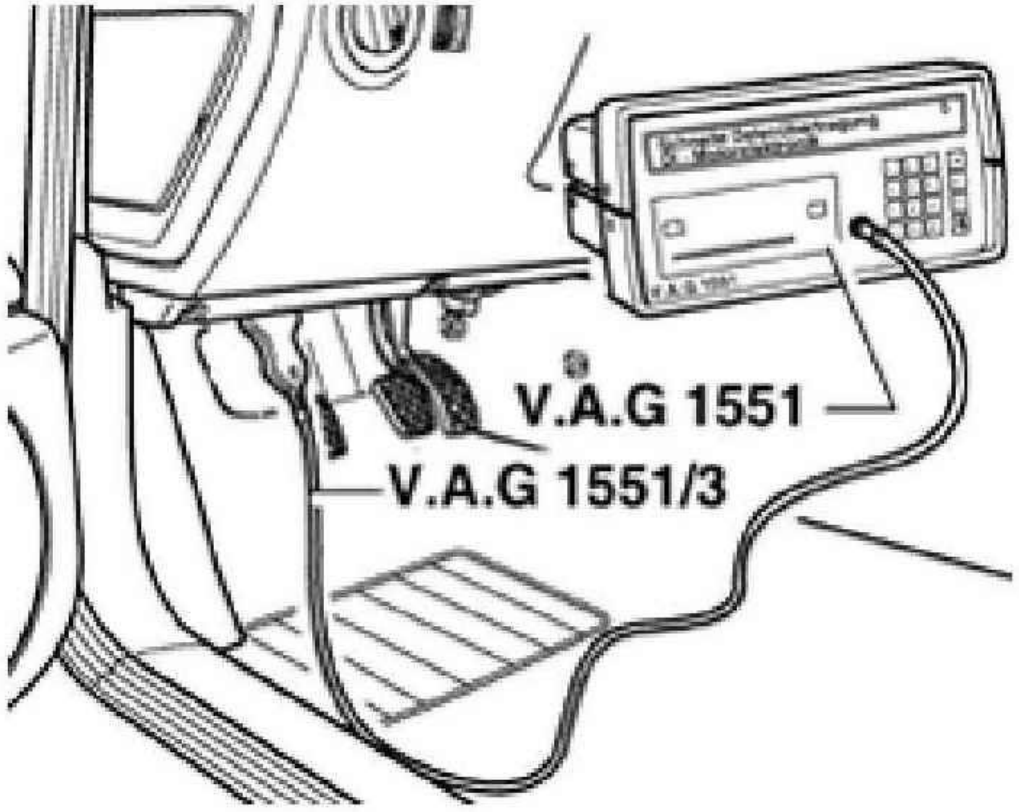

Fig. 32: Identifying Ignition Coil 6-Pin Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate starter and test ignition signal from Engine Control Module (ECM). LED should flicker.
- Switch ignition off.

If LED flickers and voltage supply is OK:

- Replace ignition coil with power output stage (-N70-, -N127-, -N291-, -N292-). See item 2 .
- Erase DTC memory of Engine Control Module (ECM). See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If LED does not flicker:

- Check wires. See **CHECKING WIRING** .

Checking wiring

- Connect test box to control module wiring harness. See **TEST BOX FOR WIRING TEST, CONNECTING** .
- Check wires between test box and 6-pin connector for open circuit according to wiring diagram.

  Cylinder 1 terminal 2 + socket 102

  Cylinder 2 terminal 3 + socket 95

  Cylinder 3 terminal 4 + socket 103

  Cylinder 4 terminal 5 + socket 94

  Wire resistance: max. 1.5ohm

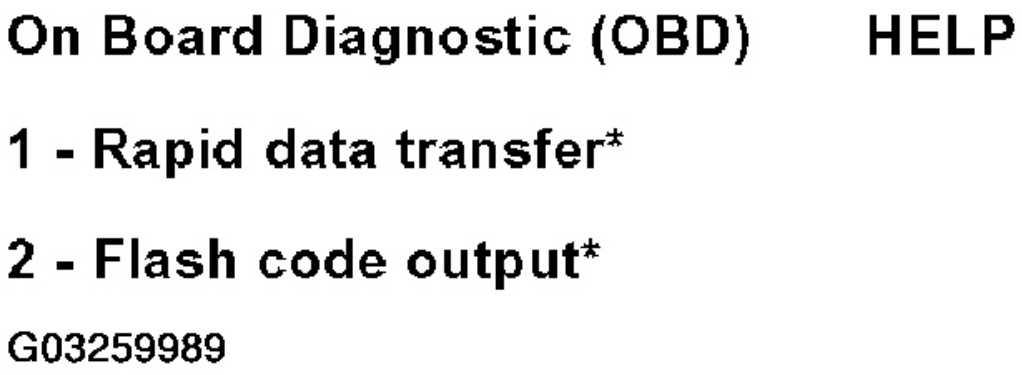

Fig. 33: Identifying Ignition Coil 6-Pin Harness Connector Terminals (Engine Code AVH, AZG, BDC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Also check wires for short circuit to each other. Specified value: INFINITY ohm

  If there is no malfunction in wire connections:

- Replace Motronic Engine Control Module (ECM) -J220-. See **REPLACING ENGINE CONTROL MODULE (ECM)** .